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Ethnobiological Studies in the American Southwest

II. The Ethnobiology of the Papago Indians

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INTRODUCTION

Papagueria, the home of the Papago, is a barren strip of country along the Mexican border between the Gila River in southern Arizona and the Altar in northern Sonora. The northern portion of Papagueria was a part of Mexico until 1854, the year of the Gadsden Purchase. Many of the Indians speak Spanish and the whole country shows customs of Spanish origin. This country was, in the old days, always thought of as part of Pimeria Alta, the land of the Pimas, who are now scattered along the Gila River. Papago and Pima, in fact, speak the same language with only slight variations, and have for the two tribes only one name, The People, being differentiated as River People (Pimas) and Desert People (Papagos). For our purposes we may allude to the combined People as Pimans, since most statements that can be made about one branch of the Pimas are true or have been true for the other, and it is only within comparatively recent times that a noticeable difference has grown up.

The Pimans are a part of the great Uto-Aztecan language family which stretches from Idaho to beyond Mexico City. Their own language is similar to that of other tribes in northern Mexico, such as Opata, Yaqui, Mayo, Tarahumare, and Huichol. They were thought of by the first Spanish explorers as the northernmost of the wild tribes who stretched into the wilderness beyond Mexico City, but because of the inhospitality of their desert land they did not suffer the thorough conquest which befell the other Mexican tribes, and have thus kept many of their ancient customs intact.

The great missionary, Kino, came to the Papagos in 1687 and labored brilliantly for some twenty-five years. But the church could not be induced to make of this desert country the elaborate venture which he desired. Although a few priests were sent to help him the missions dwindled

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soon after his death and their later history, in spite of the picturesque labors of the saintly Garces, shows no great revival. The Papagos, after a brief Spanish influence, were left to their own devices. They had acquired horses from the Spaniards, and had learned to plant wheat and some imported vegetables and fruits. Their houses gradually changed and adobe dwellings came into use, and as they adopted clothing it was the colorful mantilla and the Spanish cowboy costume which appealed to them. Many had been baptized by Kino and they continued to seek the priests so as to get for their children Spanish names. Except for these changes their old life continued, while the Pimas, whose contact was with the American whites of gold rush days, changed more rapidly. This paper therefore presents a brief account of Papago customs and ethnobiology as reported by the first Spaniards and as seen in the remoter villages at the present day.

The Papago country is one of the hottest in the Southwest; the annual rainfall is about five inches and this takes the form of violent storms in the summer, when for a few hours the washes run full. The country is a series of flat valleys between abrupt low ridges or hills, and it is only in the hills that there are springs which give a permanent water supply. Therefore, to get even drinking water the Papagos had to lead a migratory life, although it was a migration within set bounds. In the summer, after the torrential rains, they moved to the flat land to plant their small gardens, and from this base scattered out on food-gathering parties. The women brought in leaves, fruits, seeds, and roots; the boys hunted rabbits and birds, while the men attended to what agriculture was possible. They dug a reservoir which supplied them with drinking and washing water while it lasted, after which the whole village had to move.

There was generally a winter camp where all the members went, and this was called the Well, while the summer dwelling was known as the Fields. At the Well every family

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At the Well every family had a house or some sort of shelter, and there they kept 221 a duplicate set of heavy household utensils such as jars [415] and grinding stones.

When they settled for the winter the men hunted deer in the nearby mountains and the women made pottery and baskets, although many families wandered about hunting and trading and did not settle. The Altar valley in Sonora was productive all the year and families from the north traveled down there to work for their richer kinsmen. There was, in fact, a constant going to and fro over all Papagueria.

In June the white flowers began to appear on the giant [222 cactus *(Carnegia gigantea)* and then every family returned 824] to pick the fruit and to carry it down to the summer villages for their great yearly ceremony which would bring the rain. The rains came in July, then the fields were planted and the new year had begun.

In recent days these migrations have been extended rather than otherwise. The Papagos now plant winter wheat, as they were taught by the Spaniards, and must come home in May to harvest it. Often they go to the Gila and harvest the Pima crop, working on shares, and in July they go again to the Gila to pick the Pimas' cotton. Thus there are only a few months in the year when the people can be found at either the Fields or the Wells.

Houses at all the villages are now made of adobe. In 342 the old days they were low, brush covered structures, of what has been called "wash basin shape," and the ceremonial houses are still made on that ancient pattern. There were no windows and no smoke hole. The door was a low arch, just high enough for a man to crawl through, and the only furniture was a number of mats made of sotol strips *(Dasylirion wheeleri)* laid around the edge of the one room, and which served both to sit and to sleep on. Valuable property, such as the man's bow and arrows and the woman's basketry materials, were thrust into thatch or hung from the rafters. [824 285]

252 Cooking was done in a small roofless enclosure out-
412 side. There the woman kept her mealing slab—a rectangu-
415 lar block of granite hacked into shape with another stone. She had a mortar made of a section of cottonwood log, a large porous jar for drinking water, and a few smaller pots for cooking. Most of her utensils were baskets, for this migratory people found pottery a burden. There were large willow baskets for storage, others for winnowing, for parching seeds, and for eating and drinking. Willow baskets, tightly woven and water-tight when wet, took the place of dishes. Some households owned no pottery except the water-jar.

291 Clothing, in the older times, was of skins, the man
302 wearing a breechcloth of buckskin, the woman a buckskin skirt, while those who could trade for cotton had a one-piece, wrap-around cotton skirt. Both sexes wore their hair long but tied it up with a strand of grass while at work. For warmth they often covered their bodies with grease, and on ceremonial occasions added to the grease
[304] red and white paint. Women were tattooed with four lines from mouth to chin, in zigzags, dots, or merely straight lines.

291 The Papagos were a sandal-wearing people. For long journeys they made sandals, first of basketry materials and later of cowhide, but while at home they went barefoot. Occasionally we hear of the rabbit skin blanket which was so long known among their neighbors both of Arizona and California.

412 Papago women, busy with basketry, pottery, and the gathering of wild foods, did little work at agriculture, so the men took care of the fields and did the hunting. They also had to make frequent war expeditions to pursue marauding Apaches who raided their villages to take away crops, women, and later cattle and horses. Men also made trading expeditions to the Pimas and into Mexico. As a
525 means of acquiring wealth in these primitive times gam-
556 bling should not be overlooked, for success in the ancient

Indian games of hidden ball, stick dice, and "quince" was one means to fame and prosperity. Athletic contests in which the youths of the different villages contended at kick ball and relay racing were yearly events, and a fast runner, famous in racing, was as highly esteemed as any warrior.

In government[1] the Papago unit was the village. There were several large villages, each with a few outlying settlements which were governmentally a part of it, obeying its officers and taking part in all its ceremonies. The head man of this village had no executive authority but was rather a patriarch and a priest. He knew the ritual for the different ceremonies and had charge of the sacred objects belonging to the village. His title has been translated "Keeper of the Smoke."

The brush house in which he lived was made extra large and was used as a meeting place by the men of the village, who formed an informal council. The Keeper of the Smoke passed his functions to a male relative or descendant, but there was no rule of primogeniture. Any of his relatives who seemed best suited would be instructed by him in the duties of office, but the village as a whole must finally ratify the choice. The villages each had a crier who called to the council meeting and to war. They might have an elected war leader if the Keeper of the Smoke were not fitted for battle.

After the coming of the Spaniards a much more rigid organization was adopted. The Spaniards installed in their villages a "governor" who was an executive with authority and power to punish evil doers by flogging. At least in the part of Papagueria nearest to Mexico this custom continued until recent times, so that now there is much confusion between the old idea of the village patriarch and the modern one of governor or chief.

The Papagos were divided into sibs with descent in the male line. Even in tradition, however, these gentes did not affect the marriage rules; one knew to which gens

1. This section dealing with government and social organization has been abstracted from *Papago Social Organization* by Ruth Underhill (in preparation).

he belonged, but was not forbidden to marry within it. In the same way the whole country was divided into ceremonial halves or moieties known as Buzzard and Coyote. This custom is similar to that of the Mission Indians, distant language relatives of the Papagos. But whereas the moieties of the Mission Indians forbade marriage of one moiety member with another and have given to the moiety many ceremonial duties, the Papagos know Buzzard and Coyote as names only and there are no rules or ceremonies connected with them.

Many of the old Papago ceremonies dealing with birth and death are no longer practiced but there are enough old people living so that we can at least have an account of them. A mother, about to give birth to a child, went to a separate hut kept for "dangerous women." Not only women in childbirth but women in their periods came under this heading, for the strange power of reproduction seemed to the Papagos fraught with magic and death. The new mother remained in this segregation hut for a month before she and her baby might emerge. Then the medicine man gave them both a mixture of clay to drink while he pronounced a purification formula.

Young children were continually urged to be industrious for this was the supreme Papago virtue. Boys were expected to have a dream which would tell them what career to choose and give them power to follow it. Girls usually did not dream but when they reached maturity a special ceremony was held for them. The girls were kept apart from others for four days, then bathed and brought out to dance with the whole village. Sometimes this dance continued every night for a month, and at the end of that time the strange new power which had visited the girl was thought to be tamed. Her parents soon visited the parents of an industrious youth and arranged that the two should be mated. There was no marriage ceremony other than the coming of the boy to the girl's house and taking her home with him after four days. They lived with the

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boy's parents until one or two children had been born, when they erected a hut nearby. 582

Death was little solemnized by the Papagos. Fearing that the spirit of the dead would drag with him his loved ones, they bestowed the corpse as quickly as possible in a crevice in the rocks leaving with it food, drink, and possessions, and adjuring it not to come back to frighten the living. Often they burned the house to discourage such visitations, and many of them, like the California Indians, never mentioned the name of the dead. 764 [768]

Papago life appears to be barren of material for ceremony but these wandering people, nevertheless, developed an elaborate system of observances. Their art impulse, deprived of opportunity for costumes and paraphernalia, expressed itself in song and poetry. Their ceremonies were based upon a long myth, describing the origin of all things. In this myth the People were brought up from underground by their leader, Elder Brother. They marched conquering through the country where Casa Grande now stands, driving out the old inhabitants, the Hohokam, or All-Gone-People. In the course of their adventures, there arose all the needs which later beset Papago life: the need for rain, for corn, for venison, for the taking of scalps, and the curing of disease. As each need arose, Elder Brother met it by leading the People in action and by singing a song. These songs, which punctuate the narrative at all its dramatic points, are often charmingly lyrical and descriptive. Moreover, they constituted Papago magic for all time to come. Ceremonies consisted in the singing of these songs, with appropriate dances and oratory. The mere singing was thought to produce the desired result, whatever it might be. 773 533

The Papago year was filled with such ceremonies.[2] In July, just before the rainy season, the fruit of the giant cactus *(Carnegia gigantea)* was fermented and drunk, with singing, dancing, and oratory. 796

2. This section on songs and ceremonies has been abstracted from *Papago Songs and Ceremonies* by Ruth Underhill (in preparation).

796 During the summer various nights of singing were held to encourage the growth of crops. In the autumn, when deer hunting began, a deer was ceremonially killed and its flesh eaten after a night of singing and dancing to produce health for the people. Every four years—or, in the southern part of the reservation, every year—a harvest ceremony followed the deer dance. At this time elaborate effigies representing clouds, corn, and other good things of life were carried in a procession by masked singers. If illness threatened a village a special night of singing and dancing was held to drive it away.

796 778 The Papagos felt a need not only for food, but for magic power to sustain them through the hardships of life. Such power, they held, might be attained by the performance of three acts, fraught with supernatural mystery: one was the taking of an enemy scalp, one the killing of an eagle, and one the fetching of salt from the barren desert bordering the Gulf of California. After doing any of these things, a man had brought himself in contact with the supernatural. But this was not enough. He must next purify himself by days of fasting. Then a ceremony must be held over him with the singing of Elder Brother's songs, lest his own magic injure him. Any man undergoing purification might have dreams in which some supernatural being would visit him and teach him songs which would help him cure disease, to run swiftly, to fight, or to hunt.

791 787 It was in just such dreams that the medicine man obtained his unusual power, but he must dream longer than the others. For years he did not tell of his constant supernatural experiences but finally began trying his ability, and at last was accepted publicly. This new power did not as a rule enable him to cure; he only "saw" the disease after singing and smoking to bring himself to the clairvoyant state. He then told the waiting family what had caused 755 the illness—the rabbit, the badger, the eagle, some other offended animal, or perhaps the breaking of a ceremonial rule. The cure was homeopathic. Some one must be sent

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for who had dreamed of badger, rabbit, or eagle, and could sing songs to remove their power. If a rule had been broken, the ceremony must be gone through again beside the sickbed.

The Papagos, it is obvious, believed in the power of songs and dreams to a high degree. But they were not mystics. They were, and still are, a highly practical and industrious people whose days are spent in labor, while their artistic impulse finds its release in the singing of Elder Brother's songs and the composing of new ones to supplement them.

The collection of specimens and study of techniques were done during four visits to the Papago country, extending from July to October, 1931, August to October, 1932, February to October, 1933, and November to December, 1934. These visits were financed by successive grants from Columbia University in connection with a larger ethnographical study.

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In the following pages, the Papago words have been spelled according to the recommendations of the Committee of the American Anthropological Association on the Phonetic Transcription of Indian Languages (Smithsonian Miscellaneous Collections, Vol. 66, No. 6).

The vowels *a*, *i*, *o*, *u*, are pronounced roughly as in Spanish or Italian. The vowell *ï* is an unrounded central vowel whose sound approximates that of *i* in English *sir*. *p*, *t*, *k*, at the beginning of a word are pronounced without the aspiration which follows them in English; their sounds

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104 are intermediate between *p* and *b*, *t* and *d*, *k* and *g*. At the end of a word they sound exactly as in English. *c* is used to represent a sound approximating *sh*. This sound, with *t* and *r* are the most unusual of the Papago sounds to English ears. They are made by curling the tip of the tongue toward the roof of the mouth, producing a blurred quality unknown to English.

: after a vowel means added length. ' means a glottal stop or slight catch of the breath between two sounds. The other sounds are as in English, except for a voiceless quality under certain circumstances which cannot be gone into here.

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UNCULTIVATED PLANTS USED AS SOURCES OF FOODS, BEVERAGES, SMOKING, AND CHEWING MATERIALS

1. Foods

The Papagos, like other peoples in the area, exploited 222
the vegetable resources of the desert to the utmost, and the same plant at different seasons would provide not only roots, greens or fruits for food, but twigs for basketry, wood for implements or sap for dye.

In years when the rainy season was late they lived entirely on wild foods without planting at all. When the foods ripened, during or after the rainy season, enough was gathered and stored to last throughout the year, but just before the giant cactus harvest, food became very scarce, [805] as is indicated by one of their names for May, *ko'ohk macat*, "the painful moon."

Some foods like the hackberry were simply used by 252
the people in the neighborhood, while others like agave 222
and acorns were gathered by special parties and either 438
utilized or traded. There was one island of unusual flora on Elder Brother's mountain, Baboquivari. Here, near a permanent stream, grew the special luxuries he had provided for his people, and parties went to pick them for trade or on behalf of a village. Certain staples, however, grew in great quantity and these were gathered by everybody.

Different parts of the territory used different magical 241
practices to insure a good crop, the most common being to 222
make effigies of the desired fruits and plant them in the 789
gathering grounds after a night of ritual singing. Sometimes merely an ironwood stake *(Olneya tesota)* was planted [824] instead of the effigy.

When a crop was reported ripe the village organized 222
its food gathering expedition. If the expedition were for

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222 only a day the women went alone; if it were a longer trip, whole families went. The younger women and boys fetched water daily, the men hunted and at times helped in the picking. In such cases the regular community life was transferred to the camp.

251 The picking of a crop almost always entailed measures for storage, both to keep it from spoiling and to lighten the load on the return trip. The fresh product could be eaten only by those who were in the camping party since the hot sun would shrivel it within a few hours after picking; therefore, part of the gathering technique was the roasting, boiling, or winnowing of the product.

Greens

222 Small succulent plants:
262 *mo'otari (Franseria tenuifolia)* stalks, Summer
Lambsquarter, *hiwitcuis (Chenopodium murale)* stalks, Summer
Pigweed, *tcuhukia (Amaranthus palmeri)* leaves, July, August
Lambsquarter, *tcu'ari (Chenopodium* sp.) leaves, July, August
Cañaigre *(Rumex hymenosepalus)* leaves, Spring
Dandelion *(Taraxacum officinale)* leaves cooked or uncooked
Saltbush *(Atriplex wrightii)* branches, Summer

Larger, coarser plants:
Cane cactus, cholla, *wipinoi (Opuntia arborescens)* Summer
Jumping cholla, *ha:nam (Opuntia fulgida)* young shoots and buds, Summer
Many-colored tree cholla *(Opuntia versicolor)* young shoots and buds, Summer
Cholla, *tci'orim (Opuntia echinocarpa)* buds, May
Prickly pear cactus, *nohwi (Opuntia engelmannii)* leaves with thorns scraped off, sliced in strips, Summer
Mescal, American aloe, century plant, *a'o't (Agave americana)* crown with leaves removed, Winter; central flowering stalk before it emerges, Spring
Sotol, *umu'k (Dasylirion wheeleri)* crown with leaves removed; central flowering stalk before it emerges, May
Fishhook cactus, barrel cactus, *viznaga, tciaur (Echinocactus wislizeni)* pulp, May
Night-blooming cereus, reina de roche, *ho'o'k iva (Cereus greggii)* stalks

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The small succulent plants used as greens grow near the villages and can usually be gathered within a day's excursion. One informant said: "In the afternoon, my mother-in-law would say to us, 'let us go out and gather amaranth.' So I and my sisters-in-law would take our carrying nets, walk about half a mile from the camp and fill them. Then we made soup and that was all we had for supper" (the main meal). This and the other small greens mentioned are never dried and stored but, as with other fresh crops, the family lives on them almost exclusively while they last. The branches of the saltbush *(Atriplex wrightii)* are used for seasoning either in cooking or in pit-baking.

The buds and joints of the five species of Opuntia mentioned constitute a staple crop, probably because they grow so plentifully, and *O. echinocarpa* is found in abundance on the nearby hillsides.

The branches of the chollas are composed of easily detachable joints; the flower buds which develop at the tips of the branches are gathered as they come out in May. Whole cholla joints, as well as the buds, are pit-baked and dried. Women go out in parties to gather the crop, this being done with wooden tongs made of a length of giant cactus rib *(Carnegia gigantea)*, split in two. The buds or joints are collected in coiled basket bowls and brought to a central point where an old woman directs the baking. When the picking is ended, a pit is dug, stones placed in it and heated with a mesquite fire *(Prosopis velutina)*, since creosote bush *(Covillea glutinosa)* burns up too quickly. When the stones are hot they are removed and the pit lined with ink weed *(Dondia nigra)* or with grass. Next a layer of buds or joints is placed in the pit, then hot stones, then the pit filled with alternate layers of ink weed or grass and buds and covered with earth. They camp all night while the product is baking, and roast in the campfire ashes that portion of the product which has been reserved for their evening meal. The women carry home the roasted cholla

251 and continue to go out for other batches until a large area surrounding the village has been picked over. The roasted 252 buds are used with greens of the annual salt bush *(Atriplex wrightii)* or lambsquarter *(Chenopodium alba)* as a sort of vegetable stew.

222 Although all Papagos eat mescal *(Agave americana)*, 251 many of them get it by trade rather than at first hand. It [438] grows on the hills along the present international border and is usually gathered by parties who go to Sonora to work during their winter wanderings, stopping for a week or two to pluck and bake the mescal, and when necessary storing it in pits until they are ready to carry it home.

[412] Digging sticks of any hard wood, made chisel-shaped by pounding with a stone and hardened in the fire, are used to hack the plants off at the ground. The spiny leaves are then chopped off with a mescal hatchet, a semi-circular stone blade of granite or diorite.

251 The agave is pit-baked for twelve or more hours in the same way as are the cholla buds and joints. When this is done the remains of the leaves are pulled off, leaving an inner succulent mass about the size of a cauliflower. This has a slimy consistency and a sweet taste which is highly regarded. It is kept in jars to be eaten a little at a time or traded as a delicacy.

222 The flower stalks of the American aloe *(Agave americana)*, of sotol *(Dasylirion wheeleri)*, and the shoots of the night-blooming cereus *(Cereus greggii)* are also eaten as greens. They are not very extensively utilized however. [285] Sotol is also a source of basketry material, but if the inner tender leaves have been taken for this purpose, the flower stalk does not develop. The flower stalks are dug out of the plants with a long stick having a chisel-like end, and cooked immediately but never stored.

252 An upright species of prickly pear cactus *(Opuntia* 222 sp.) is utilized by washing the large waxy flowers to remove their sticky secretion then frying them in grease, formerly deer fat, now lard.

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Another occasional food, or more accurately a drink, is the pulp of the *viznaga*, barrel or niggerhead cactus *(Echinocactus wislizeni)*. If one becomes thirsty on a journey he cuts the top off a plant with a sharp stone, pounds the pulp and scoops out the juice with the half gourd *(Lagenaria vulgaris)* which he carries as a drinking and eating vessel.

According to Thackery and Leding (25), the fruits of the viznaga are cut up and cooked with cornmeal or other material, the seeds being discarded.

Root, Tuber, and Bulk Crops

Sand-root, *caa't (Ammobroma sonorae)* October
Wild potato, *taiaroti*. A climbing species of *Solanum*. Summer
***mo'otari (Franseria tenuifolia)* Summer**
Wild onion, *sipuia* (Span.) *(Allium unifolium)* May
Papago Blue Bells, Covena, *ha'at (Brodiaea capitata* var. *pauciflora)* April
Night-blooming cereus, *ho'o'k iva (Cereus greggii)*

The staple root crops are the sand-root *(Ammobroma sonorae)* and the root of *Franseria tenuifolia*, both of which appear on the flood plains near the villages after the rains. Whole families go out with digging sticks usually in October to gather the roots of these species, and live upon them while they last. Any surplus is sun-dried on the house-roofs and stored in jars.

The sand-root has been used from time immemorial by the Papago and is parasitic upon the roots of the small desert shrubs *Coldenia plicata* and *C. Palmeri*, as well as on *Eriogonum deserticolum*. It is to be found in parts of the Southwest where the average rainfall is between only two and five inches, and is eagerly sought by the Papagos, who consider it a most excellent food; it is eaten either raw or roasted (6, 17, 24).

Palmer (20) records that these people dried and ground the stems of the sand-root with mesquite beans *(Prosopis*

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velutina) to make a pinole,[1] and discusses its general use and preparation, while Havard (14) also refers to its use by the Papago.

Similarly the tubers of the climbing potato (a species of *Solanum*) and the roots of the wild onion *(Allium unifolium)* which grow only on Mt. Baboquivari, were collected in May and mid-summer, respectively. These two plants were brought back by hunters, or by individuals who made the long special journey to obtain them to trade for baskets, skins or pottery. The bulbs of Papago Blue Bells are eaten raw. They do not have a pleasing taste and are eaten largely because they appear in early spring, before other crops are ready.

The large root of the night-blooming Cereus *(Cereus greggii)* which may weigh as much as four pounds is chewed raw for thirst or may be baked whole in ashes, peeled and eaten.

Fruits[2]

Small fruits:

u:spa't (Condolis spathulata) Summer
Mulberry, *kohi (Morus microphylla)* Summer
Hackberry, *kom (Celtis reticulata)* Summer
Boxthorn, *kuawur (Lycium fremontii)* August
Mistletoe, *hakowa't (Phoradendron californicum)* Summer
Lote bush, *u:s tcui'tpa't (Zizyphus lycioides)* Summer
Bird Cayenne pepper, *tcirtipin (Capsicum frutescens* var. *baccatum)* August
Black oak, *toa (Quercus emoryi*, also *Quercus oblongifolia)* July
Bucknut, coffee berry, quinine plant, *hohwi (Simmondsia californica)* August

Cactus and Yucca fruits:

Giant cactus, sahuaro, *ha:canyi (Carnegia gigantea)* July
Organ pipe cactus, pitahaya, *tcutcuis (Lemaireocereus thurberi)* August

1. The Papagos mean, by pinole, a gruel made of parched, ground cornmeal and water. Since the meal has been parched before the water is added, no cooking is necessary. Pinole was the only ration used on journeys, since it served both for food and drink. It was also the prescribed food during ceremonial purification.

2. The term fruit is here used in the botanical sense and thus covers berries, nuts, etc

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Prickly pear cactus, *nohwi (Opuntia engelmannii)* June, October 262
Cholla *(Opuntia fulgida)* August 22.2
Cholla, *tci'orim (Opuntia echinocarpa)* August
Soapweed, datil, *hoi (Yucca baccata)* (fruit *howitc*) Summer

Of the small fruits, *Condolis spathulata* is eaten only 222
raw and not thought worth preserving. If hackberries 251
(Celtis reticulata) or mulberries *(Morus microphylla)* are found near the village, carrying baskets are filled with whole branches of them by the women. Clusters of mistletoe *(Phoradendron californicum)*, which often grows on the mesquite bush *(Prosopis velutina)*, are gathered, their branches laid on mats, dried and the berries rolled free. These berries form a sticky mass which is further sun-dried and stored. The somewhat larger boxthorn berries *(Lycium fremontii)* are picked, dried and eaten like raisins. Only the fruit of the lote bush *(Zizyphus lycioides)* is cooked, and this is boiled to a syrup like the cactus fruits.

These people now use as seasoning the very pungent 263
bird Cayenne pepper or spur pepper *(Capsicum frutescens* var. *baccatum)* which grows in the Baboquivari Mountains and apparently nowhere else in the state. This plant may have been introduced by the Papagos and is very much used by them in their daily life as a condiment on the table or for cooking with beans or other foods. It is this species that is cultivated farther south for the hot peppers. As one drives over the Papago Reservation and [438]
stops at trading posts he invariably finds dishes of these small, dry, red, extremely pungent berries offered for sale. These always find ready buyers among the Papagos and Mexicans.

Acorns *(Quercus emoryi)* ripen in July a little later 222
than the giant cactus fruit, but grow in only a few hilly places, mostly at the south of the Papago territory, and are gathered on a long camping excursion similar to that for the sahuaro fruit. For the most part acorns are eaten [432]
fresh from the shell. Bucknuts *(Simmondsia californica)* are similarly eaten though not in quantity. Russell (22)

Russell (22)
222 refers to the Papagos as trading acorns *(Quercus oblongi-*
[439] *folia)* to the Pima.

The important fruit crop comes from species of cactus, and of these the giant cactus or sahuaro *(Carnegia gigantea)* is most outstanding, its ripening preluding the rainy season, the drinking ceremony, and the new year. The Papagos depend upon this fruit to a much greater extent than do any other Indian people of the Southwest, and some six hundred families gather about 100,000 pounds each year (25).

222 Every family has an accustomed camp on some slope
361 where sahuaro grows, and here they have a rough shelter, with a water jar, perhaps a metate, and a cooking pot. Cactus camp is always an occasion of jollity. It means almost the first fresh food of the year, for much of the pulp is eaten fresh; the first taste of anything sweet; and, principally, the preparation for the great drinking ceremony which is regarded as responsible for bringing the rains.

222 The picking season lasts about two weeks. The women of the camp, sometimes assisted by the men, make two trips a day into an area perhaps half a mile square, which is their acknowledged territory, visiting every cactus plant in this area once in three or four days to gather the fruit as it ripens. Each carries a bowl-shaped, water-tight bas-
[415] ket (more recently a lard pail is used) to receive the pulp. One large basket, used as a general receptacle, is propped in an ocotillo bush *(Fouquieria splendens)* at some central point.

222 The fruit of the sahuaro grows at the extreme top of
417 the shaft, which is sometimes twenty-five feet high, or at the tips of the branches, and is hooked down with a long pole made of two giant cactus ribs spliced together. For-
[283] merly the splicing was agave fiber; now it is wire. At the top of this pole, and again at a lower point, perhaps five feet down, are affixed short transverse sticks of creosote bush *(Covillea glutinosa)* or of catclaw *(Acacia greggii)* for the purpose of aiding in dislodging the fruit.

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The fruit, if fully ripe, splits open when it hits the ground; if not, the woman twists off the fruit stalk which bears a hard circular calyx with sharp edges and with this she splits the fruit. In either case she scoops out the pulp from each half with two motions of her thumb and throws it into her basket, while the thorny shell she throws on the ground, taking care that its red lining falls uppermost, for this hastens the rain.

After each round the women pour the newly gathered pulp, of a deep crimson color, into a water-tight basket and soak it to remove the black seeds, which will later be used for flour. Since it shrivels within a few hours if left in the sun, they cook their harvest daily, usually at midday which is too hot for pulp gathering. The mother or mother-in-law officiates on this important occasion. She drains the water from the pulp, some of which has been soaking since the night before, breaks up the masses, shakes out as many seeds as possible, washes and dries these on a mat in the sun, and places them in a jar. The pulp, with double the quantity of water, is brought to a boil in a clay pot, then removed from the fire and placed in a straining basket. The liquid drained off is placed on the fire and boiled to a syrup, this being set aside from day to day. When the whole quantity is at hand it is sealed in a jar made air-tight by cementing a potsherd over its mouth with adobe mixed with fine grass or a transparent yellowish-brown "gum" gathered from the *samo prieto (Coursetia glandulosa)* upon which it is produced by a scale insect *(Tachardiella fulgens)* (25). This is the liquid from which the ceremonial drink *navai't* is made and each family keeps its supply to be fermented at the time of the general ceremony (see also Densmore, 9).

When the juice has been drained off as described above there remain the pulp and the seeds which can also be utilized. All households make cactus jam, the most important sweet in their diet, and for this only a portion of the juice is drained off. The remaining moist pulp is boiled to a sweet, sticky mass, looking much like raspberry jam.

251 If the liquid be drained off completely there remains a
252 dry mass of fiber and seed which is further dessicated on the housetop. It is then beaten with a stick to separate the seeds and these are parched and stored; they may be used to make meal cake or as chicken feed. One final product from the giant cactus is oil, which can be extracted from the seeds by parching them, grinding and adding water, after which a small quantity of oil comes to the surface. The pulp, instead of being disposed of as described above, may be sun-dried, stored, and cooked up as needed to make syrup, or it may be eaten dry or after being moistened with water (25).

222 The smaller fruit of the organ pipe cactus or pitahaya *(Lemaireocereus thurberi)* is as highly prized as that of the giant cactus and may be treated in the same way. It is less common, however, and grows only in the southern part of Papagueria and in parts of modern Sonora. It fruits twice a year and its many low branches are so plentifully
[821] covered that the Papago name for Milky Way is "the second harvest of Pitahaya."

114 The word *pitahaya* was used rather loosely by the
222 Spaniards as a name for several of the tall cacti of Spanish America, together with their fruits including the sahuaro *(Carnegia gigantea)*. Perhaps the earliest reference to the pitahaya is one quoted by Bancroft (1) who states that Juan de Oñate, conqueror and governor of New Mexico, while on an exploratory journey westward from his headquarters on the Rio Grande in 1604, reported that he at length came to a country where the "tierra caliente began to produce the pitahaya." Padre Kino (3), the Jesuit friar, whose explorations from 1687 to 1710 covered southern Arizona as far west as the Colorado River, recorded in his memoirs the use of cactus fruits by the Indians of that region.

222 The Papago distinguish two kinds of edible prickly pears *(Opuntia* sp.), one of which produces chills and nausea in susceptible people. Groups of women pluck the

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fruits with tongs, pile them on the ground and brush them vigorously with creosote bush branches *(Covillea glutinosa)* to remove the spines, then carry them home and use them as an adjunct to a meal. The usual method of utilizing the fruit is to eat it fresh in large quantities while the supply lasts, unused fruit being dried or made into syrup. To dry it they scoop out the pulp and remove the large, hard seeds with the fingers, then spread grass on the ground and sun-dry the pulp on it for two days, after which it can be stored in a sealed jar. To make syrup they mash the pulp in a basket with a stick, squeeze out the juice and strain it twice; it is then boiled and again strained.

The fruits of the two chollas *(Opuntia fulgida* and *O. echinocarpa)* ripen in late summer, and are handled in the same manner as the buds, that is, gathered, pit-baked and carried home (25).

Similarly the datil fruit *(Yucca baccata)* constitutes an important staple crop which is gathered and preserved. As much as possible of the banana-shaped, sweet, pulpy fruit is eaten fresh and some carried home for that purpose. A gruel is also made from the fresh fruit. The seeds are removed by hand and the pulp ground on the metate, some cornmeal being rubbed on the metate and muller to prevent sticking. The pulp is then cooked with cornmeal and the seeds are dried.

In preserving the fruit two methods are employed. One is to open the fruit in the field and remove the seeds and fiber, these being taken home in sacks to dry. In drying they are spread on racks of sahuaro ribs *(Carnegia gigantea)* in the storehouse, and when perfectly dry are beaten on a mat to remove the fiber. The released seeds form hard lumps which are stored in baskets and ground into meal when needed. The other method is to dry the pulp in the field. Women scrape it out with the fingers, pat it into cakes and dry these on a hot stone. This drying is not sufficient for storage so the cakes are taken home and spread on the roof, and when thoroughly dry are stored in a jar.

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Seeds[3]

262 Sacaton, *ohki (Sporobolus wrightii)* September
222 Peppergrass, *ka:cowani (Lepidium thurberi)* September
opom (Monolepis nuttalliana) September
Pigweed, amaranth, *tcuhukia (Amaranthus palmeri)* September
Tansy mustard, *cu'uwa't (Sophia pinnata)* September
Mesquite, *kui (Prosopis velutina)* August
Little leaf horse bean, palo verde, *ku'k tciata'k (Parkinsonia microphylla)* August
Jerusalem thorn, bagote, palo verde *(Parkinsonia aculeata)* August
Ironwood, palo de hierro, *hoitkam (Olneya tesota)* August
Devil Claw, unicorn plant, *ihu'k (Martynia fragrans)*

222 The species of grass seed which ripen in September and October around the villages are collected and winnowed. One informant said "We would work all day and feel as though we had done so much and there would be about a cupful." One method of winnowing is to pull up whole plants, lay them on a fiber mat and beat out the seeds with a stick. Another method, which is used with a very light grass, sacaton *(Sporobolus wrightii)*, is to burn the whole patch, then sweep the seeds off the ground. With *Monolepis nuttalliana*, the seeds of which are difficult to remove, the method consists in boiling the stems, then collecting the seeds from the bottom of the pot. The seeds of Amaranth or pigweed *(Amaranthus palmeri)*, so important among the Aztecs, are also collected and utilized as an important source of food. The most common of the seed crops, however, is tansy mustard *(Sophia pinnata)*.

251 The technique for storage of all seeds is basket-winnowing, parching and sun-drying. This winnowing is the same as that practiced by the Pimas and many of the Yumans, and consists in shaking the seeds horizontally in a flat basket, now and then jogging the basket so that the chaff is brought to its upper edge to be taken off by the wind. Seeds are never stored without cooking for fear of mildew. While parching they are placed in a flat basket with a few

3. Botanically some of these are fruits.

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embers and shaken constantly to prevent burning. Or they 251
are placed on a piece of broken pottery jar directly over the coals and the seeds stirred with a stick; after parching they are spread on the house roof for thorough dehydration before being stored.

Mesquite beans *(Prosopis velutina)* ripen in August 222
near the summer villages and formerly constituted an im- 251
portant crop. The pod, which was much prized, has a 252
sweetish taste and could be eaten fresh.

These beans could be either ground up like other seeds as flour, or the bean and pod could be pounded into a pulpy mass in a mortar, since they were too sticky for the metate. The resulting pulp was boiled. Beans were dried in the pod if they were picked near home, as the bulk was not too much to carry. In that event they were spread on the house roof and turned until thoroughly dried, then put away in a jar. If bulk needed to be reduced the sun-dried pods were flailed to beat out the seeds, the whole then winnowed in a basket and the seeds parched and stored.

The other legumes, ironwood *(Olneya tesota)* and palo verde *(Parkinsonia microphylla* and *P. aculeata)* produce beans which were flailed, winnowed, and parched in the same way as that described for mesquite.[4] The seeds of the devil's claw *(Martynia fragrans)* are also boiled and eaten.

2. BEVERAGES 272

Sahuaro, giant cactus, *ha:canyi (Carnegia gigantea)* juice fermented
Pitahaya, organ pipe cactus, *tcutcuis (Lemaireocereus thurberi)* juice fermented
Prickly pear cactus, *nohwi (Opuntia engelmannii)* ---juice fermented
Lote bush, *u:s tcui'tpa't (Zizyphus lycioides)* -------juice fermented
Jimson weed, thorn apple, *kotata'p (Datura meteloides)* root ground and infused
Tansy mustard, *cu'uwa't (Sophia pinnata)*----------made into tea
Sage *(Salvia columbaria)* ----------made into tea
Broomweed *(Baccharis sarothroides)* ----------made into tea
Joint Fir *(Ephedra nevadensis)* ----------made into tea

4. The chemical composition of the beans of *Parkinsonia aculeata* has been investigated by Robert A. Greene, Bot. Gaz. 94:411-415, 1932. He has found the composition of the whole bean to be similar to that of alfalfa hay or mesquite beans.

273 The only important intoxicating beverage is a sort of cider made from the giant cactus fruit *(Carnegia gigantea)*. In districts where it grows it is brewed once a year by each village with elaborate ceremony, the brewing, the drinking and the actual intoxication being part of the ritual for bringing rain.

When the beverage is to be made every family contributes a jar of boiled juice to the large jars ceremonially guarded in the council house. At present each family also makes several jars for home consumption. As soon as the juice is decanted from its air-tight receptacles, it is mixed with four times the quantity of water, the ideal being a mild intoxicant which can be taken in quantity. A small fire is lighted in the council house to keep up a steady moderate heat, and official tasters direct the fermenting process. They usually have a small jar of the liquid, already fermented, from which they add some to the large jars if fermentation is too slow. Individual Indians bury their jars in the ground to obtain heat. The established fermenting time is seventy-two hours.

The resulting drink, called *navai't*, is a crimson-colored sort of cider with a slightly nauseating taste, which, when drunk in the ritual quantity induces vomiting. This beverage is almost impossible to keep, therefore the tradition is that the whole supply must be consumed within twenty-four hours.

A similar drink, made from the pitahaya or organ pipe cactus fruit *(Lemaireocereus thurberi)*, was used in the southern part of the Papago territory, and constituted the ceremonial drink for that area. Fermented drinks were once made from the prickly pear fruit *(Opuntia engelmannii)* and from the fruit of the lote bush *(Zizyphus lycioides)*; these were never extensively used, however, and had no ceremonial significance.

276 The Jimson weed *(Datura meteloides)* grows plentifully in the region but in spite of its use by neighboring Yuma, Zuñi, Ute, and some California Indians as a narcotic,

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informants insisted that a decoction of the root was drunk only occasionally by private individuals among the Papagos.

Peyote *(Lophophora williamsii* or *Lophophora lewinii)* appears not to have been known by the Papagos unless it be one of the unidentified roots, rumored vaguely as powerful magic, that come from Mexico. It seems to have little importance for any of the desert area. Hrdlička (15), however, records that the Papagos and Pimas did use peyote slightly.

Tea-like drinks for refreshment were made by steeping the seeds of tansy mustard *(Sophia pinnata)*, a sage *(Salvia columbaria)*, broomweed *(Baccharis sarothroides)*, and joint fir *(Ephedra nevadensis)*.

3. SMOKING

coyote tobacco, *wiupuri (Nicotiana trigonophylla)* leaf dried and smoked
a lichen, *tcewĭ'ţ hiṣi'k*

Tobacco *(Nicotiana tabacum)* was regularly cultivated but wild tobacco *(Nicotiana trigonophylla)* grew on Elder Brother's mountain. Those who could do so made the expedition to secure it for trade. It was dried, then smoked in a tube made of a section of carrizo *(Phragmites communis)* stem about six inches long, or when carrizo could not be obtained the tobacco was wrapped in the inner white husk of an ear of corn.

The lichen referred to, known as "earth flowers," also grows on Elder Brother's mountain. The informants referred to it as a yellow growth on the north side of rocks which had to be scraped off with a knife. The only specimen procured was not in a condition to make determination possible. This lichen, apart from its magical uses, was dried and mixed with tobacco for smoking; it had a dizzying effect, and an odor that could be noticed from a distance. This may be the *pihol* flowers referred to by Densmore (9).

261

4. CHEWING

Mesquite, *kui (Prosopis velutina)* ---------- gum chewed
White brittlebush, *tuhawus (Encelia farinosa)* ---------- gum chewed
Milkweed vine *u'upa't (Philibertella heterophylla)* ---------- gum chewed
Ocotillo, *mīro'k (Fouquieria splendens)* ---------- honey chewed

The lumps of clear white gum-like secretion found on the branches of the mesquite bush *(Prosopis velutina)* were gathered by the basketfull, and might be chewed just as they were found, or they might be dried and then ground on the metate. The dried granules could be mixed with sahuaro syrup and eaten like jam, or be ground up again with any of several species of cactus seed, then boiled in sweet, thick gruel which hardened like candy when it cooled. Children chewed the secretion from the white brittlebush *(Encelia farinosa)*, while the gum-like secretion oozing from the stem of the milkweed vine *(Philibertella heterophylla)* was placed on a piece of broken olla over the coals. When heated, it became rubbery and children chewed long strings of it.

Nectar pressed out of ocotillo blossoms *(Fouquieria splendens)* hardens when dry like rock candy. This is chewed as a delicacy.

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THE GROWING AND UTILIZATION OF CULTIVATED PLANTS

The material difference which distinguished the Papagos from the Pimas in the old accounts was their lack of irrigation, consequently they had no cotton or cotton clothing (10, 18). This lack was definitely due to scarcity of water, for in all the valleys where there were usable streams, irrigation is reported. The Papagos were by definition the people who lived away from these valleys. Their planting was usually *de temporal* "thunderstorm" agriculture. That is, the people waited until the ground was thoroughly soaked by the summer rains and then planted their seeds in the moist earth at the mouth of a wash; these crops were often later lost because of insufficient water supply. The Spaniards reported such planting specifically at Saric and Tucubavia (18), and a more comprehensive statement records that this was the usual method for the Papagos north of Casa Grande (10).

Mange (18) reports that some who lived inland away from arroyos did not plant at all, but "live very poorly, naked, on roots, wild sweet potatoes and mesquite beans."

The first Spanish travelers found the Pima-Papago people raising corn, beans, and pumpkins (10). In the first journeys at the end of the seventeenth century, before the Apache raids had become serious, abundant crops are often mentioned (17). The Spanish missionaries made a wide distribution of wheat, kidney beans, lentils, vetch, chick peas, and, according to one account, watermelon (27). At first they reported the people "very diligent in planting" (10), but after a hundred years of Spanish occupancy and Apache raids the complaint was: "They plant very little and the missionary has to give them seeds and tools or they will not plant at all" (10).

After the period of disorganization and migration contingent on the Apache raids agriculture slowly revived. At

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241 present irrigation is practiced in the same river valleys where the Spaniards found it, although only one of the irrigated localities falls within the United States Papago Reservations with which the present paper is concerned. This is San Xavier del Bac, outside Tucson. The old residents of this district died out during epidemics and Apache raids, and Papagos from the desert have moved in within the last sixty years to take their places. Through the rest of the area the old Papago settlements plant *de temporal* as formerly. The government wells scattered through the reservation are used for watering stock, and to make it possible for the residents to remain the year around, but they do not affect agriculture.

132 The rainy season in Papagueria is concentrated in July and August, when almost all of the five to eight inches falls. The washes, dry for the rest of the year, are at times filled for a few hours with a torrent of muddy water which sometimes covers the adjoining land to a depth of two or three inches, and it is after the ground has been thus moistened that the Papagos break it up for planting.

132 241 222 In the first bulletin of this series (6) reference was made on authority (22) to the Papago as never having been an agricultural people, depending entirely upon the wild products of nature for their food supply. A study of the Papago as indicated above has shown however that this needs qualification; they do exploit the vegetable resources of the desert to the utmost, and in years when the rainy season is late live entirely on wild products without planting at all; nevertheless, they have at least at times a rather well developed agriculture. July is known among them as the "Month of Rains" and August as the "Month of Short Planting." If the heavy rains are delayed until August, these people sometimes do not plant at all since the growing season is too short to allow the crops to mature before frost. In this event they change their whole scheme of living; they eat the seed-corn and beans and spend the rest of the summer in food gathering and the winter working wherever employment can be obtained.

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Most hamlets make some effort to channel the flood water to their fields. Ditches are dug from the wash to the fields situated alongside, the ditch ending in the middle of the field so that the water will flow all over it. If there be several fields, one beyond the other, there may be a main ditch with several branches. 241 312

Planting in the old days was never begun until after the first rain ceremony had been held. This was not because it was taboo, but because the soil would be too dry. Any village which found it convenient held the first ceremony and "caused the rain." After that successive villages held ceremonies during the summer so that the rain would continue. 241

Nothing in the nature of plowing was done until after the coming of the Spanish missionaries. Since then until rather recently (when the steel plow was introduced), plowing has been done with a plow made from a single piece of mesquite wood *(Prosopis velutina)* (7). Before that the procedure was simply to wait until the ground was moist, then make holes with the digging stick and drop in the seed The digging stick was the same as that in the western Pueblo area and northern Mexico—a straight stick without a footrest, made of ironwood *(Olneya tesota)*, four feet long with a sharp point hardened in the fire. The man using it stood erect and dropped it into the soft earth where it made a hole four to six inches deep. A woman followed, carrying the seeds in a small basket; she pushed a little loose earth into the hole with her bare toes, dropped in four seeds, and covered them with a single foot movement. [17]

In order to get the seeds in as soon as possible before it rained again, the whole hamlet generally worked together. If rain came the same day, the seeds would be washed out; if not for three or four days, they took root. They might be washed out several times in succession, in which case planting would be given up.

The principal work of the summer was keeping the ditches clean but cultivating was also done with the weed

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241 hoe. This was a sword-shaped slab of mesquite *(Prosopis velutina)* about two feet long, sharpened on the lower edge.

Crops were harvested in October, giving a growing season of about one hundred days. After being flailed or winnowed, then thoroughly dehydrated on the roof of the house, they were stored in jars or baskets. The Papagos usually hid their food for safe-keeping.

LEGUMES

262 Tepary, *pawi (Phaseolus acutifolius* var. *latifolius)*
241 Kidney bean, *mu:nyi (Phaseolus vulgaris)*
Vetch *(Vicia sativa)*
Lentil *(Lens esculenta)*
Chick pea, garabanzo *(Cicer arietinum)*

241 Freeman (11), who has made a careful study of the beans and teparies of the Southwest, collected two different types of beans from the Indians of southern Arizona. They were recognized by the Indians as distinct, and are commonly known by the names, "Frijoles" and "Teparies." Frijoles belong to the group of common kidney beans *(Phaseolus vulgaris)*, while teparies belong to that large and variable species, *Phaseolus acutifolius*.

The native tepary, *pawi*, a staple crop of the Papagos and from which they received their nickname *papawi o'otam* (bean people), was grown by Indians of southern Arizona and Sonora and as far west as the Cocopa Indians (13), but its name comes from a Spanish pronunciation of the Papago phrase *i pawi* (it is a bean). The Spaniards found the Papago growing this crop in 1699 (18), and their later reports refer to it as "the small native bean called tepary" (27). The Papagos cultivate at present as many as fifteen varieties of tepary, represented chiefly by different colors (11). However, the one found most valuable for cultivation and for cooking purposes is the white tepary, which grows both as a bush plant and as a climber.

241 Varieties of tepary have been found growing wild in
174 western Texas and New Mexico, also in Sonora, and it must have been cultivated at an early period since a specimen of

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it has been found in pueblo ruins in northern Arizona. "It was excavated in 1931 from site N. A. 1814, which was a masonry pit-house which seemed to be associated with a P. III small pueblo. The tepary was identified by Gilmore at the University of Michigan and, according to Gilmore, it is the only case of tepary being found in a prehistoric ruin. The specimen was carbonized when the site burned."[5] (The date of this pit-house would, according to present reckoning, fall between 900 and 1350 A. D.) It seems to be established that the aboriginal bean cultivated by the Cocopas was the tepary (13).

Freeman (11) is of the opinion that the tepary was domesticated by prehistoric Indian Races from wild plants growing in the canyons of southwestern United States and northern Mexico. He also believes that the teparies were probably not domesticated from the type form of *Phaseolus acutifolius* A. Gray, but from a larger, more robust, broad-leaved variety of the species, such as was collected by Wright in a valley of Sonora as early as 1854, and described by Gray as distinct, but left unnamed by him, probably on account of lack of material, now abundantly available. However, the careful and extensive work of Vavilov (26) indicates that the cultivated tepary *(P. acutifolius)* is originative of Southern Mexico and Central America.

Planted and grown under dry conditions, side by side with the kidney bean, the tepary has been known to fruit when the kidney bean had not even flowered, and when both fruited the tepary yielded four times as much as the kidney bean. It was no wonder, therefore, that when the season was too short for corn the "bean people" still managed this crop.

Frijoles, now grown by the Papago and in the Southwest in general, are probably descendants of varieties introduced by Spanish missionaries, apparently from Mexico. Russell (22), referring to *Phaseolus vulgaris*, states that

5. Correspondence from Dr. H. S. Colton, Director, Museum of Northern Arizona, under date of June 28, 1935.

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241 174 "At least one variety of the common kidney bean, pole bean, bunch bean, etc., was known to the natives before the advent of the Spaniards."

241 Teparies and frijoles are still planted at the beginning of the rainy season in holes three feet apart and six inches deep. When harvested the vines are laid on the ground and the beans threshed out with a stick; or if a very large crop, it may be threshed with horses, as is wheat. The threshed [251] beans are dried on the ground or roof and stored in jars. Vetch *(Vicia* sp.), lentils *(Lens esculenta)* and chick peas or garabanzos *(Cicer arietinum)*, all of which have been introduced, are planted in February with the wheat and harvested like wheat in May, but otherwise are treated like beans.

CORN *(Zea mays)*

[262] 243
Red corn ..... *si-wihpiki huhnyi*
White corn ..... *to:ta huhnyi*
1. large grains
2. small grains

Yellow corn ..... *s'uam huhnyi*
1. small, irregular grains, like popcorn
2. large grains, soft
3. a modern variety, attributed to the Navajo

Blue corn ..... *s'tciata'ki huhnyi*
1. small, regular grains
2. large, irregular grains *(ku:pi)*

Crazy corn, grains of all colors ..... *tcihpawi huhnyi*
Laughing corn, mixed red and white, large grains..... *hihihmi huhnyi*

All these varieties are mentioned in Papago planting songs but at present the only ones commonly found are yellow and white. Gifford (13) mentions both a yellow and white and a white soft maize, also a flint maize, grown by the Cocopa under the Papago name of *huhnyi* (corn) and credited to the Papagos.

The different colored corn grains were stored and planted separately and never allowed to mix. When har- [251] vested the grains might be removed from the cob with a

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stone scraper, then parched and dried on a mat on the roof, or whole ears might be roasted. In this case a fire was made in an open pit and the ears thrown in on the hot coals when it had burned down. Two women turned the ears with green mesquite sticks *(Prosopis velutina)*, allowing them to roast for several minutes and throwing them out on a bed of grass. These roasted ears were dried and beaten to remove the grains, which were then winnowed and stored in a basket to be ground into meal when needed; they were also cooked whole with meat.

Corn, like the other aboriginal staples, squash and beans, was planted with an invocation, and the ceremonies centered around it as the most important crop. There are songs for every stage of its progress: leaf appearing, stalk growing high, ear forming, and tassel forming. Almost all ceremonial orations, even those for war and for averting evil, end with an account of the ideal good fortune—a fine crop of corn. In another of the important cermonials, the fetching of salt from the Gulf of Mexico, the salt was always called corn and procuring plenty of it augured a good crop. Ceremonial use was made of cornmeal as was the custom among the pueblos. With the Papagos this meal had to be made of "flatheaded corn," generally twin ears, the juxtaposed sides of which were flattened. No attempt was made to raise such ears—they were simply saved as they occurred.

Freeman (12) isolated a race of native corn, which he designated Papago sweet corn, from grains obtained from the Papago Indians of southern Arizona. He originally secured two types which he crossed, and from this eventually developed the strain of Papago sweet corn. This, however, has not been entirely successful since it contains little sugar and is not a good yielder.

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CUCURBITS

244
[262] **Pumpkin, *hahri (Cucurbita pepo)***
Cushaw, Crookneck pumpkin, *caskate'ki (Cucurbita moschata)*
Muskmelon, *unwi hahri (Cucumis melo)*
Watermelon, *kihpi (Citrullus citrullus)*

Both *Cucurbita pepo* and *C. moschata* are commonly regarded as aboriginal species among the Papagos, although this has not been definitely established. The Spanish records refer to the Pima-Papago people as growing *calabasas* (10, 18), a word which was used quite loosely in old Spanish writings to denote pumpkins, squashes, or melons. Mange (18), in 1697, spoke of *melones* (probably muskmelons) and *sandias* (watermelons) as growing on the Gila and it is quite possible that these were grown from seed given by Kino, since this was ten years after his arrival. Other authorities state that watermelons were given the Indians by the Spaniards (27). Pumpkins were planted in the rainy season with an invocation like corn. When harvested the rind was peeled off in a long spiral which was hung from the house roof to dry, after which it was tied into bundles and stored in jars. Muskmelons and watermelons are grown at only a few places, such as San Xavier, where there is plenty of water. No attempt is made to store them.

[251]

TOBACCO

[276]
249 **Coyote tobacco, *wiupuri (Nicotiana trigonophylla)***
Yaqui tobacco, *wiiw (Nicotiana tabacum)*

The first species used was the native *Nicotiana trigonophylla*, which grows wild on Elder Brother's mountain and is still used to some extent. In addition to this the Papagos and Pimas, at least fifty years ago, were cultivating the common tobacco *(N. tabacum)*. Seeds of this Yaqui tobacco, as the Papagos called it, were probably traded from Mexico. These seeds, in the possession of old men who did the tobacco raising, were considered very valuable and sometimes given as gifts.

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Tobacco was planted in March and the planter would choose a place at the mouth of a small wash, out of sight of all the other fields, for tobacco had to be grown in secret. As soon as the plants were up creosote bush branches *(Covillea glutinosa)* were stuck in the ground to shade them. No one but the planter must now visit the patch or the plants would become shy and sink into the earth again. If a menstruating woman were to see them they would shrivel up and die.

No hoeing or transplanting was done but merely earth heaped around the roots now and then. A fence of mesquite posts *(Prosopis veluntina)* with thorny cholla cactus *(Opuntia* sp.) between protected them from marauding animals, and a ditch dug from the wash to the patch conducted any possible rain water. The creosote bush shelter was left until the plants grew up and touched it. When the tobacco was ripe the leaves were pinched off and spread on a mat outside the house to dry, although they were considered ready for smoking when about half dried, still green and very bitter.

COTTON

Cotton, *to'ki* (*Gossypium* sp.)

The early Spanish accounts refer to cotton as being grown, not only by the Gila Pimas (10), but by the Sobaipuris on the San Pedro (27) and by the people of San Xavier (10) (who were not the present residents). Little mention is made of the growing of cotton by the desert people, but informants thought a little was grown in favored places. No particulars of its culture were obtained. Cottonseed flour made very good browned cakes when baked on hot sand.

WHEAT

Wheat, *pi:rkanyi* (*Triticum aestivum*)

Wheat seeds were given away profusely by Kino at the end of the seventeenth century. Most Papagos, however, say they did not take over its general use until two or three

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243 generations ago, when they learned more about it in Mexico. Many old people knew no flour in their youth, save that from wild seeds. One reason for this may be that until government wells were dug in the flats they were not able to live there in the cool weather when wheat should be planted.

At present most families raise enough wheat for their own use, planting in February and harvesting in May. After the field is plowed, wheat is planted by hand and the ground then harrowed. Occasionally the planter mixes his seed wheat with ashes and scatters the two together (7). The method of harvesting is that used in Spain in the seventeenth century, and consists in cutting the wheat with a scythe or sickle, then threshing it on a threshing floor—a circular patch of hardened ground, belonging to the patriarchal family in common.

When wheat is to be threshed three horses are hitched abreast, the inner one tethered by a long rope to the pole, and are driven round and round to trample the grain. One man walks behind and drives them, while one keeps the wheat stalks raked evenly over the threshing floor.

For winnowing the people wait for a windy day, then place the grain in large winnowing baskets about three feet
251 across and toss them until the chaff is blown away. Wheat is stored in grass granaries three or four feet high and about four feet in diameter (7). When flour is needed the
[252] grains are softened with water and pounded in a mortar with a stone pestle. The grain is now dried on the roof in the sun and then shaken in baskets until the hulls are blown away. Most of the wheat used by the Papagos is ground with the metate and mano, although some of it is now ground on the grinding mill.

243 The Papagos cultivate chiefly Sonora wheat *(Triticum aestivum)* which is very drought resistant. They use it for making their native breads, but it does not make a good leavened bread on account of is low percentage and poor

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quality of albumen. At present some of the more progres- 243
sive Papagos are growing *Early Baart* wheat which was introduced some years ago by the University of Arizona and is now quite generally cultivated in the state.

HUNTING AND UTILIZATION OF WILD ANIMALS AS FOOD

LARGE GAME

262 Mule or black-tailed deer, *huavi* ---------- *(Odocoileus hemionus)*
Arizona white-tailed deer, *siiki* ---------- *(Odocoileus couesi)*
Antelope, *kuvi't* ---------- *(Antilocapra americana)*
Mountain sheep, *tcicinyi* ---------- *(Ovis mexicanus)*
Peccary ---------- *(Pecari angulatus)*

224 The mule or black-tailed deer is the game animal around which Papago ceremonies center; it was abundant over the whole country before grazing became extensive, and is still to be found on Mt. Baboquivari and in the uplands just across the border.

Deer hunting was a profession engaged in by only a few. These men bore the title of Headbearer and spent their winters in laying up a supply of skins, sinew and fat, which they traded at times as far as the Gila and Altar valleys. They were also often skilled workers in hides. Deer hunters usually wore a deer head disguise, although a few depended entirely upon clever stalking.

The disguise was made by cutting off a deer head at the neck and removing the skin from the skull with a flint knife, reaching up through the neck and through the mouth, widened for the purpose. The skull was finally pulled out through the mouth which was then sewed up to proper size. Grass was stuffed into the skin to keep the shape while being sun-dried. Next the antlers were shortened from the base and fastened into the head, and the eye openings were either sewed up or fitted with pebbles. After this [824] a loop of flexible catclaw *(Acacia greggii)* was fitted around the hunter's forehead and the skin of the deer neck sewed to this, so it would dry the right size to fit the hunter's head. Thus prepared, the stuffed head was dried in the sun until the skin was hard and stiff.

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This stuffed head was fastened on top of the hunter's 224
head with buckskin strings. Two pieces of buckskin were worn over the body to the knees, the one in front which came above the chin being white to imitate the deer's belly, while that in the rear was blackened with soot to make it look like the deer's back; the arms and legs were smeared with white clay. In hunting the Headbearers wore the disguise and walked on all fours, rubbing against bushes and imitating the sound of female deer, and thus could get within easy shooting distance.

The deer meat was usually cut into thin strips and sun- 251
dried on the spot. The tendons were carefully cleaned and 237
kept, the long black tendons for bowstrings, the shorter ones for fastening foreshafts. The brains were kept for tanning and the hide folded up to be used as described elsewhere in this paper. The fat was used to mix paint and for greasing the body.

Arizona white-tailed deer, found in the mountains, was 224
also stalked in disguise. The antelope was much more rarely hunted. Bear *(Ursus americanus)* seems never to have been hunted by the Papagos.

The mountain sheep has for a long time been found only in a few inaccessible mountain slopes and canyons. Once, however, it must have been plentiful, as the Spaniards in the early eighteenth-century found on the Gila a midden heap of six thousand horns of animals, deer, and mountain sheep (18). Later Anza (4) found such piles in the western desert. Only an old Sand Papago from Sonora, however, had any recollection of mountain sheep hunting.

Turkeys were usually shot with arrows when they were 223
roosting but seem to have been used only for their feathers, 224
never for food. Coyotes *(Canis lestes)* were also sometimes shot. Although nothing was learned of the utilization of the peccary *(Pecari angulatus)* as food its seems reasonable to suppose that the Papagos did eat this animal since it was commonly eaten by their neighbors, the Pimas.

SMALL GAME

262 Black-tailed jackrabbit, *tcu'k tcu:wi* ---------- *(Lepus californicus)*
White-tailed jackrabbit, *s'toa tcu:wi* ---------- *(Lepus alleni)*
Cottontail rabbit, *to:pi* ---------- *(Lepus arizonae)*
Packrat, *ko:son* ---------- *(Neotama albigula)*
Round-tailed ground squirrel *ci:ri'k* ---------- *(Citellus tereticandus)*
Merriam pocket mouse, *naha'kio* ---------- *(Perognatus spinatus)*
Kangaroo rat, *tahiwua* ---------- *(Dipodops sp.)*
Gambel quail, *kakaitcu* ---------- *(Lophortyx gambelii)*
Mourning dove ---------- *(Zenaidura macroura)*

224 The Papagos differed from their neighbors in that their procedure with these small animals was to shoot them with [410] bow and arrow, rather than to trap or club them. For the purpose they used arrows of creosote bush wood *(Covillea glutinosa)* with a wooden tip hardened in the fire.

[261] The Papagos considered cottontail meat sweet and jackrabbit poor. However, jackrabbit was the one meat available at all seasons, though in spring the animals were so thin as to be almost useless.

Rabbit shooting was usually done by the boys. The one exception was the rabbit hunt held in recent times just before the drinking ceremony. For this there was a regular director who also functioned in games. The Papago hunt differed from the Pueblo practice in that no stick was used and women did not take part.

The hunt took place in spring. All the men and boys engaged formed a circle about two miles in diameter with a line of the best bowman at one point. These men remained stationary while the circle converged and drove the rabbits toward them. All the killing was done with bow and arrow.

Rats and squirrels were hunted systematically at their holes. The packrat, largest of the group, was a very common food, and as it builds its nest surrounded with thorny cholla joints *(Opuntia* sp.), the process was to scare it out. Ground squirrels were smaller and less desirable, while pocket mice were too small but were eaten in "the hungry time." The kangaroo rat was a last resource.

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Gambel quail was the most important food bird. It was trapped in a very rough cage of split giant cactus ribs *(Carnegia gigantea)*. Mourning doves might also be caught in it though these were usually shot with arrows when they were roosting at dusk; they are still hunted and used as food. No bird eggs were ever used.

REPTILES AND WORMS

The desert tortoise *(Gopherus agassizii)*, known as *komaktcï'ṭ*, was not hunted but people seeing one would take it home and cook it for food.

The worms used were, when young, about an inch long and yellow, but they matured in a few days and turned green. They appeared in quantities just after or during the rainy season on any green growth, especially the amaranth *(Amaranthus palmeri)*. Everyone dropped work to gather them, for they were considered a great delicacy.

DOMESTICATED ANIMALS

The Papago pets in the old days were dogs *(Canis familiaris)* and a few species of birds. Dogs were used to guard the houses, rarely for hunting. The breed was a small white one, in build like a coyote *(Canis lestes)* but with softer fur and only half the size. Coyotes were kept as pets if captured young.

Arrow feathers were obtained from a species of hawk *(Accipiter* sp.), and these were housed in wicker cages and fed with rats and lizards. The tail feathers were pulled whenever they grew long enough. Spanish accounts speak of a number of macaws *(Ara* sp.) being kept for their feathers at San Xavier (27), but this being before Papago occupancy there is no tradition of it.

Father Kino (3) at the beginning of the eighteenth century distributed droves of horses *(Equus caballus)*, cattle *(Bos taurus)*, sheep *(Ovis aries)*, and goats *(Capra hircus)* to all his missions and to many villages where he hoped to establish missions later.

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231 When the Jesuits left the country most of these animals went wild, as did those of mining towns and ranches deserted through fear of the Apaches. Thus the "Pimas" early had an opportunity to secure and train horses for themselves, and this was beginning even in Kino's own time. "A few (cattle from frontier posts) remained and went wild. The mares produced colts and these the Pimas caught and raised" (18, p. 246).

The nomadic desert people seem to have had little share in this early horse era. In tales told of the grandfathers [481] of old informants, men were still going about the country by running thirty to fifty miles a day and war parties 726 were conducted on foot, "because the Apaches got horses 231 before we did." As the Apaches were gradually subdued by the Federal Government communication grew easier and horse owning spread. On the last war parties in which fathers of informants took part, horses were the rule. At [492] present scarcely any man is without a horse and many families have a wagon and team. In 1931 there were 10,700 horses to 2,679 men (21).

231 Cattle were taken up much less easily. The wild ones were killed for their meat, and especially their hide which has been the material for Papago shields and sandals for two hundred years. The Federal Government has made a policy of giving the Papagos cattle on credit, and in 1931 there were 22,930 head of grade cattle to a population of 5,228 (21). Thus riding the range has succeeded hunting as the occupation of the average young man.

FOOD PREPARATION

The Papago diet consisted ordinarily of dried foods: 262
cereals, dehydrated vegetables, and sun-dried meat. Fresh foods were available for only short periods, when they were consumed in quantity.

The year round staple was flour, made from corn; the 252
beans of mesquite *(Prosopis velutina)*, ironwood *(Olneya tesota)*, or palo verde *(Parkinsonia microphylla)*; pumpkin seeds *(Cucurbita pepo)*, dried yucca fruits *(Yucca* sp.*)*, sahuaro *(Carnegia gigantea)* and various other wild seeds. The technique with all these except the sticky mesquite was to parch, sun-dry, and store in sealed jars. The parching was done at the time of gathering and was really part of the storage technique to prevent mildew, although the seeds were not ground into flour until just before they were used. The mesquite beans, too sticky for a metate, were pounded in a mortar made either of stone or wood (a mesquite log hollowed with a stone axe). Women who went to gather the fruit of the Spanish Bayonet *(Yucca elata)* often pounded it to a pulp in hollows of the rocks.

Flour was used most often in the form of a gruel. 272
There were two kinds: *waka*, the Mexican pinole, which served warriors and people on journeys with both food and drink, was made by simply mixing parched corn flour with water. *Ator*, the gruel served at home on non-ceremonial occasions, was made by boiling the flour with water and salt. The pot in which it was cooked was rarely empty, and for a meal a little more flour of any kind was added, and the whole cooked. Thus all sorts of combinations were possible, the favorite being cornmeal with sahuaro seed flour *(Carnegia gigantea)*, which was slightly oily and sweet.

Mesquite flour, unlike other flours, was made at the 252
time the beans were harvested. The housewife ground parched seeds and made the flour into a compact cake. This was sprinkled frequently with water for several days until

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it hardened into a lump, called the "mesquite turtle," and pieces could be broken off and eaten just as they were.

Breadstuffs were used much less often than gruel. The most common was the tortilla made of cornmeal and water. Flattened balls of this dough were quickly cooked on a heated pottery griddle; or they might be baked in the ashes of the hearth, thus making a sort of ash bread. Among the Papagos of Sonora, however, wheat flour tortillas were and still are dominant. Cottonseed flour (*Gossypium* sp.) and sahuaro seed flour which are oily, made very good browned cakes when baked on sand heated under hot stones.

Gruel or bread was the basis of every meal and the usual addition was boiled dehydrated vegetables. All greens like aloe (*Agave americana*) and cholla joints (*Opuntia* sp.) had been pit-baked before storing, while root crops and the cultivated squash and beans had been simply sun-dried. All of these were taken from the storage jars and soaked both to freshen them and to remove dirt, then boiled with water and salt. A favorite dish was a form of succotash, made of dried teparies and corn grains.

Fresh greens like amaranth (*Amaranthus palmeri*) and fresh squash were also boiled, but, since water was scarce, anything that was juicy enough was roasted. This was the treatment for the flower stalks of aloe and sotol (*Dasylirion wheeleri*), the joints of cholla, cañaigre greens (*Rumex hymenosepalus*), and squash. Ashes were raked out of the fire and the vegetables buried in them. In a period of marked water shortage dehydrated vegetables also could be treated in this way after the first soaking.

The sweets, highly prized, were dried fruits, fruit jam, fruit syrup, and honey. Sahuaro (*Carnegia gigantea*), pitahaya (*Lemaireocereus thurberi*), and prickly pear (*Opuntia* sp.) fruits could be dried and stored in jars, but not for long because they became wormy. Syrup and jam from all these fruits were made when they were picked. The flowers of mesquite (*Prosopis velutina*), ironwood (*Olneya tesota*), and species of yucca have a good deal of nectar. These

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plants bloom just before the rainy season so that during the 253
summer honey was plentiful. As a confection people sometimes chewed acorns *(Quercus emoryi)* and squash seeds.

The meat of large game was usually cut into thin strips 252
and sun-dried by the hunters on the spot, although in cold weather a man might bring home his kill and eat some of it fresh, then cut up and dry any remainder. These dried strips, which at best did not keep long, were hung from the roof, and when needed were pounded soft with a stone and boiled.

Fresh meat could be either grilled or boiled. For grilling, venison was cut in strips, rabbits were skinned, since the skin was useful, and birds were roughly plucked. Birds and rats could be roasted in the ashes but the skin was left on for protection. Or, meat was boiled in a jar directly over the fire. Wild pepper *(Capsicum frutescens* var. *baccatum)*, added to the meat was a great delicacy. [263] A favorite dish was a stew of rabbit and various roots. The desert tortoise *(Gopherus agassizii)* was always ash-roasted, after cracking the shell with a stone, pulling out the entrails and inserting hot pebbles.

The worms used were gathered by women who pinched off their heads and squeezed out the entrails, leaving the outer portion which was lengthened in the process to a narrow string six inches long. They braided these strings, put the braids in carrying nets and went back for more.

The fresh worms, fried on the tortilla sheet in their 251
own fat, made a feast in which everyone indulged while they 252
lasted. The surplus was dried and stored but kept better if pit-baked before drying. One informant said "they were the best tasting food we had."

PLANTS AND ANIMALS USED AS SOURCES OF CLOTHING, ORNAMENT, AND COSMETICS

281 Ancient Papago clothing was of mule and Arizona
291 white-tailed deerskin *(Odocoileus hemionus* and *Odocoileus couesi)* and this skin clothing was one of the marks distinguishing Papago from Pima, since the latter wore cotton garments variously colored (18, 27). For the desert area which came to be called Papagueria the clothing varied from the buckskin loincloth to more elaborately made garments and mantles. The first observers found some "nude except for the women's white aprons of rabbit or deer skin" (18, pp. 216-230).

Living informants do not remember skin clothing in the loincloth and apron form, though in their childhood such garments made of cotton were still to be seen. From these and from tradition they describe the simplest skin garments.

Men wore a breechcloth, *atoca*, consisting of a soft strip of buckskin, tied around the waist, with another narrower strip passed between the legs and under the front and back of the belt; in its folds were arranged pockets in which tobacco could be carried. The upper part of the body was naked except in cold weather when a buckskin was thrown shawl-wise over the shoulders and tied with thongs. The rabbitskin *(Lepus* sp.) garments had disappeared, though rabbits were and are still plentiful. By degrees the buckskin shawl developed into a shirt with the coming of sewing, and eventually the shirt became an elaborate tailored
[306] garment with a yoke, long sleeves, and fringed seams, the whole being dyed red from the root of *Krameria glandulosa*, and sometimes decorated with white chalk or an appliqué of white buckskin. While the old deerskin costume consisted of only shirt and loincloth, hunters who were rich in hides wore long deerskin leggings with fringed seams reaching to the hips. An informant of ninety reported that in her youth young dandies came to the dances in leggings of

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western goshawk skin *(Astur atricapillus striatulatus)* with the feathers on.

Women wore a breechcloth like that of the men and over it an apron of two buckskins pulled over a belt, one in front and one in back. In the memory of informants, however, women wore only cotton aprons in the same way "because we didn't know how to sew." Deerskin skirts were then being sewed by professional leatherworkers, like the shirts, and were similiarly dyed and decorated, and in addition might have a border of deer hoofs around the bottom with a fringe of deer hoofs on short thongs around the waist. The upper part of the body was naked except for a buckskin shawl like that of the men, which, however, never developed into a shirt.

The garments made of cotton were similar in shape to those of buckskin. Men wore a cotton breechcloth and women two cotton aprons. But women sometimes wore a single strip of cotton twisted around the waist and wide enough to reach below the knees. It might be held in place with a thong, a twist of rope, or with one of the colored belts described above.

Although the Papago are known to the Navajo as "sandal people," their sandals were used only for hunting, war, and journeys. Most informants remember no sandal material other than cowhide *(Bos taurus)*, which began to be obtained by trade soon after the first Spaniards reached the country. However in the mountainous country toward the Gulf, the skin over the knee of a mountain sheep *(Ovis mexicanus)* was found strong enough if doubled. In the Baboquivari valley people used for this purpose the bark of the hackberry tree *(Celtis reticulata)* which comes off in smooth slabs.

Leather sandals were made with the sole straight across the toe end, sometimes with a projection in the center, like the Apache flap, to protect the great toe. Under the heel end was laid an extra piece of rawhide with two narrow tabs which came up through slots in the sole to take

291 the buckskin lacing. Another type of sandal is described as made of two thicknesses of deerskin dyed red and bound to-
[556] gether at the edge with white deerskin. The "rich" had buckskin moccasins to the knee.

415 Pouches were made for carrying tobacco, paints and
281 fetishes, the simplest being a round piece of dressed buck-
skin fringed all around the edge and tied up with a thong.
[386 All those made at present are of dyed buckskin (colored red
824] with dye from the root of *Krameria glandulosa)* made of two semi-circular pieces sewed together, with fringe around the
[284] seam and a flap fastened by a knot of thong serving as a button. Others were made of rabbit skin *(Lepus* sp.) or sometimes fox *(Vulpes fulvus)* with the fur left on.

291 No headdress was ordinarily worn, although warriors
292 had various caps and ornaments. The *siwoṭ* was a single upright plume, stuck in a headband which might be woven or be merely a deerskin thong. The *pitcpoṭ* was a row of feathers around the head like a crown thrust under a buckskin band. A more elaborate bonnet was the *acki wonam* —a buckskin cap with upright feathers sewed closely all over it with an especially high tuft on the top. There is also mention of a cap of peccary skin *(Pecari angulatus)*
[237] fitting closely to the head with upright eagle *(Aquila chrysaetos)* or hawk feathers (because they are the best fighters) sewed around its edge and a mask of buckskin hanging over the face and tied around the neck. Warriors might also tie a bunch of eagledown to the hair at the top of the head, or some long feathers to the hair at the back.

302 Men wishing to keep their hair out of their eyes tied it
284 with a deerskin thong, or for gala occasions with a woven headband of red and white cotton. For war they tied it at the back of the neck with a deerskin thong, then twisted the mass into a short club wound about with deerskin, and this was specifically called the war knot. Women always wore their hair loose except for a thong or a twist of grass tied around the forehead while working. In racing they brought the whole mass of hair up over the forehead and back again,

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binding it with a strip of soapweed *(Yucca glauca)*. The hair was brushed with the combination brush and comb made of a bundle of aloe fibers *(Agave americana)*.

The Papago myths tell of Elder Brother wearing bright feathers, probably macaw *(Ara* sp.), and a Spanish account records:

> At San Xavier del Bac and neighboring rancherias there are many macaws which the Pimas raise because of the beautiful feathers of red and other colors, almost like those of the peacock, which they strip from these birds in the spring for their adornment (27, p. 129).

Both sexes wore necklaces and earrings and hunters particularly made handsome necklaces of deer teeth. Women were tattooed with vertical lines on the chin, a woman specialist doing the work for which she was paid a necklace or a basket of corn. Her piercing instrument was four sahuaro needles *(Carnegia gigantea)* tied in a row with a shred of yucca fiber *(Yucca glauca)*. She pinched up the skin between her forefinger and thumb and pierced it, and many patients had crooked lines because they winced. Into the holes she rubbed charcoal from a fire of creosote bush *(Covillea glutinosa)* which leaves a permanent greenish blue color. The ears of both sexes were pierced early in childhood with an ocotillo thorn *(Fouquieria splendens)*.

Paints were made from clay, charcoal, specular iron, and vegetable dyes, and since the upper part of the body was habitually naked it provided plenty of field for design. Vegetable dyes were rather rarely used and then only by women. Red dye was obtained from the root of *Krameria glandulosa* while the pollen of a reed (probably *Arundo donax)* provided a yellow dye. In daily life older men and women did not paint, but smeared deer grease over the body when necessary for warmth, as did hunters and warriors before going on an expedition.

The root of the soapweed *(Yucca glauca)* was dried, pulverized, and mixed with water to form suds for washing the hair.

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515 the hair. The fruit of the wild pumpkin (*(Cucurbita foetidissima)* is dried and grated into soapy water in modern times to bleach clothes.

302 The buds and blossoms of the catclaw *(Acacia greggii)* were dried and kept among a woman's possessions as a perfume sachet.

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PLANT AND ANIMAL MATERIALS USED IN BASKETRY AND WEAVING

Since wood was not available and a migratory life made pottery inconvenient, basketry supplied most of the furniture and household utensils. One major need which it could not provide however was clothing, as the desert fibers were too coarse and stiff. The technique consisted of wrapped weaving, netting (coil without foundation), plaiting, and coiling.[6]

285

Wrapped Weaving

The binding together of coarse strong slats was the technique used for the house frame, shelf, door, cradleboard, trap, bird-cage, and a number of ceremonial objects. One of the chief warp materials was the ribs of the giant cactus *(Carnegia gigantea)*; these formed an upright bundle of long slats when the fleshy portion had rotted away, and were ready for immediate use. They might also serve for roofing and all sorts of light tools. For curved structures more pliable materials such as the twigs of the black willow *(Salix nigra)*, the catclaw *(Acacia greggii)*, and the root of mesquite *(Prosopis velutina)*, were used. Since the willow grows only along washes and therefore rarely in the Papago country, the twigs were usually obtained from the Pima country by families who went out to cut wheat for the Pimas in May.

The weft of wrapped weaving was made of split datil leaves *(Yucca baccata)* or of the American aloe *(Agave americana)* for large coarse objects like the house frame, while for finer ones buckskin or sinew was used.

The house frame might also be a sort of lattice wrapped weaving with warp of ocotillo rods *(Fouquieria splendens)*,

6. Expert work on the technique and art forms of Papago basketry has been done by Kissell (16) and by Weltfish (unpublished). Bressale (5) also gives a number of illustrations. For further detail the reader is referred to the publications of these investigators.

17:Castetter & Underhill N.E-5 (1931-1934) 1935
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285 and weft of the soapweed *(Yucca elata)*. A form of screen door was made by joining a row of sahuaro slats by one or two rows of deer hide thong in simple wrapped weave, while for a shelf they used a narrower row of similar slats stiffened at each end by a transverse slat bound on with a thong.

285 The cradle board was about two feet long, made on a 854 frame of catclaw twigs, willow twigs, or mesquite root in the shape of an elongated arch, while transverse pieces of giant cactus rib were bound across this frame with deer sinew. The transverse pieces did not extend to the rounded end, where a small coiled basket was lashed to hold the baby's head "so it will not be flat like an Apache." A small mat of shredded aloe fiber was laid over the giant cactus ribs, while another similar mat covered the baby and was lashed to the cradle with buckskin thongs.

285 Bird cages were made with two triangular or arch- 231 shaped ends over which was tied a flexible mat of giant cactus ribs, made on the principle of the door.

285 For ceremonies such as the *vikita* or harvest festival, large structures were made, sometimes six feet square, representing clouds or mountains. The basis was a framework of flexible ocotillo rods *(Fouquieria splendens)*, bent into shape and lashed with thongs. These were carried on light platforms made like the shelf.

COIL WITHOUT FOUNDATION

285 The carrying net is no longer used since the Papagos 415 have come into possession of wagons, but it has frequently been described by earlier observers (16, also Weltfisch unpublished).

The net itself was of two-ply aloe fiber *(Agave americana)* in the shape of an inverted truncated cone, the stitch being what has been called "coil without foundation." The cone was supported by four cross poles and fastened to the rim at the top by hair cord, which also passed through the hole at the bottom to be tied again with hair cord under-

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neath. The whole projected above the woman's head and served as stays for loads of wood and other loose objects. The frame was so constructed that the rear portion of it could rest flat against her back, while she supported the two front poles of the frame by a plaited headband made of aloe cord. The carrying net is the only article of basketry dyed in color, the frame being spotted with red clay and the lacework rubbed with red clay and indigo to bring out the pattern.

Men carrying deer meat used a bag of knotted netting without a frame, made of two-strand aloe fiber. After the advent of the horse these were used as saddle bags. Also, two of these bags stuffed with grass formed a primitive saddle.

PLAITING

Since the Papago had little cotton or weaving they supplied the lack of fabrics partly by skins and partly by plaited articles made of sotol *(Dasylirion wheeleri)*. Sotol, too coarse and rough to be used in making clothing, was utilized to make large, tough sleeping mats which could be rolled up and carried about; also in making cradle mats, back mats for the carrying frame, headbands, headrings, and two kinds of baskets.

Sotol leaves are prepared for use by first scraping off the spiny edge with a knife, then splitting the leaves lengthwise in two with the thumbnail (the thumbnail in olden days was kept long to be used as a knife). These withes are triangular in cross-section, and the cushion of pulp on the inner margin is removed, making a flat strip of uniform thickness about an inch wide, with both a rough and a smooth side. The withes are dried in the sun for a few days, then wrapped and stored. When needed they are buried the night before in moistened ground in order to make them flexible.

The sleeping mats made of sotol, and similar to the Mexican *petate*, were about six by three feet with rounded

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285 corners. Mats of his kind, made of cattail *(Typha latifolia)*
513 with a wicker edge are used by the Hopi.

285 Sotol back mats to be placed between the back and the carrying frame were of the same shape as the above but much smaller, and with a space left near one end for the poles to pass through. Sometimes a mat of similar shape and construction was laid on the cradle board under the pad of aloe fiber.

[142] The sotol headband for the carrying net was a ring of plaiting about three inches wide, doubled flat. The head-ring for balancing pots was a cylinder about six inches in diameter folded triple to give strength.

Sotol baskets were of two shapes. The trinket basket had rounding sides with a square base and cover, and might be from eight to twelve inches across. A square, shallow basket of this same weave but with spaces left between the strands was used as a sieve. The second type of basket—the *waca* ceremonial basket—was oblong, shaped like a deep box, the lid being a duplicate of the basket except slightly larger, and was tied on with a thong. Large baskets of this sort were used to hold the sacred objects belonging to a village, and were wrapped in skins for further protection and kept in a cave or a tree. Smaller baskets of this type were used by individuals to hold scalps, eagle down, curing fetishes or shaman's properties, though shamans also used buckskin bags.

COILING

All Papago women made coiled basketry, though the more difficult plaiting and netting were often left to the experts. Twigs, particularly willow *(Salix nigra)*, were considered the best foundation for coiling since they are strong and swell when wet, making the basket water-tight. Willow twigs were secured from the Pima country and had to be peeled on the day they were cut or the bark would adhere. After being peeled the twigs were split in two lengthwise with the aid of a basketry awl, dried in the sun, and then carried home.

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In the Papago country several kinds of twigs are obtainable, especially those of the mulberry *(Morus microphylla)*, the catclaw *(Acacia greggii)*, and the bloodroot bush *(Tatropolia cordiophylla)*. Mulberry twigs were gathered by families who went to the mountains for that purpose in the rainy season; although tough and hard to handle they were split like willow twigs, and made serviceable baskets. Catclaw was similarly gathered and prepared except that its thorns were knocked off with a stone before it was peeled and split. The bloodroot bush has a thick rubbery stem which cannot be easily split, so its smooth, branchless, unpeeled stems made bulky baskets.

The leaves of several plants such as beargrass *(Nolina erumpens)*, datil *(Yucca baccata)*, soapweed *(Yucca glauca)* and sotol *(Dasylirion wheeleri)* were frequently used as foundation in coiled basketry. Formerly the women severed the beargrass leaves one at a time and brought them home in the carrying net; the leaves were sun-dried and, for use, split into four, five, or six strands. At present the practice is for a man to go out and cut whole tufts of beargrass with an axe and haul home in a wagon a six-month supply. When beargrass was not obtainable the soft and bulky datil, the soapweed, and the stiff and brittle sotol were used for foundation. The final resource was a species of tall red grass which abounded in the rainy season.

For the sewing element there were, formerly, only two materials, a white and a black. The black was *ihu'k*, the unicorn plant or devil's claw *(Martynia fragrans)*. It grows wild in the Papago country but women, long ago, began to protect fertile patches of it by erecting a fence of branches to keep off the rodents. Now many sow the seed and raise a regular crop. Women with no access to devil's claw make long journeys to buy the dried pods, for without them no coiled basket can be made.

The part of the plant used is the pod, which is very tough in texture and, in color, a deep permanent black. The pod has a rib on each side, much like a string bean, but the

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285 ribs project beyond the pod in long, wire-like hooks. Great globular bunches of these pods, with their projecting hooks hang in the house of every basket maker. Before they can [361] be split and bent as sewing withes, the pods must be softened with lye and water. The Papago method of accomplishing this is to spread them on the ground, scatter wood ashes over them and leave them for a week. Just before they are to be used, they are buried in dampened ground. The next morning, they are sufficiently softened to allow the ribs and hooks to be split off. One rib and hook together form a strip about ten inches long and pithy in the middle. The worker splits it in two, removes the pith and thus has two sewing strips, each a quarter inch wide. These strips she keeps soaking in water while she works, so that they will be pliable.

The white element in the design was always willow *(Salix nigra)*. The strips are the same as those used for the foundation except that, for sewing, one withe is split into six or eight strips. Since willow does not grow in the Papago country, women, in the old days, economized by making their baskets largely black. An old Papago basket can be distinguished from a Pima by the predominance of black in the design.

285 For modern commercial purposes, women have begun 439 to use the inner leaves of *takwi*, or soapweed *(Yucca glauca)* for sewing. The women gather, dry, split, and clean off the rough edges of these leaves much as they do with sotol. Their color is whiter than willow but it forms a soft non-water-tight basket used only for trade. Also, under the influence of traders, women have begun to introduce the outer leaves of soapweed which have turned brown with age, and women who make basketry a business have begun to experiment with other twigs and roots.

285 The most important article made in coiling was the bowl, which varied considerably in shape according to its uses for winnowing, stone boiling, serving liquor, gathering, sorting, parching, and storing food. A large inverted

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basket bowl constituted the drum, and a small basket might serve as a drinking cup. All these because of the hard usage received were usually made of willow throughout, but for the water-tight vessels willow was essential as it swelled and filled the interstices.

The water bottles (no longer used) were tall, slender bottle shapes with an incurving neck. They were smeared outside with a gum-like secretion from the white brittlebush *(Encelia farinosa)*.

The basket granaries seen were about three feet high and sloping up gradually from a two-foot base. The warp element was beargrass *(Nolina erumpens)* or wheat straw when the latter was available; the weft, mesquite bark *(Prosopis velutina)*. ((For details see Kissell, 16).

The tools for coiled basketry are awls with points of varying length, at present made of steel but formerly of mesquite wood, generally with a handle of creosote bush wood *(Covillea glutinosa)*.

COTTON SPINNING AND WEAVING

Weaving was a rare art practiced by a few old men. One who wanted a cotton blanket or skirt would trade for the cotton, either from the few who raised it or from the Pimas. He might be able to have the spinning done at home but generally he brought the load of raw cotton to the weaver, with the gift of a large basket, beads, or dried produce. This was the price for the weaving.

The weaver called in all his neighbors for a spinning bee, giving them their meals as pay. Both men and women could spin but it was a favorite occupation of old men. They first ginned the cotton by putting it in a basket bowl and working the seeds out with a stick. To separate the fibers the worker twanged his bow string over them, causing the topmost fibers to twist around the string. This method is described by Spier (23) for the Maricopa who perhaps learned it from the Pima. The cotton was spun on a spindle of arrow weed *(Pluchea sericea)* eighteen inches high, with

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283 a whorl made of a section of sahuaro rib two inches wide and three or four long. The spinner placed the spindle tip in a depression in the ground then twirled the spindle clockwise with his right hand and fed the cotton with his left.

286 The loom was horizontal. The weaver placed upright in the ground four stakes of ironwood *(Olneya tesota)* or other hard wood so that they stood ten inches high. They formed a rectangle three feet wide and as long as the desired piece of cloth, generally about seven feet. Across the three-foot width the weaver fastened two cross-pieces, usually of sahuaro rib tied on with buckskin thongs. Across these the cotton warp was strung, passing under each bar and back over the top so that the strands formed a figure eight. This was the only shedding device used, for the weaving was all in one color. The batten was a length of sahuaro rib and the shuttle a short, smooth stick of creosote bush *(Covillea glutinosa)*.

Narrow belts, headbands, and cradle bands were woven on the same sort of loom but much narrower. These were plain red or red and white. The pattern was entirely in the [286] warp where strands of cotton, dyed red with *Krameria glandulosa*, were arranged in the desired order. The weft was all white and used merely as a filler.

PLANT AND ANIMAL MATERIALS USED AS SOURCES OF ROPE AND STRING

The Papago had a plentiful supply of rough cordage 283
material but very little that would make fine strong string. The rough materials were soapweed *(Yucca glauca)* and lechuguilla *(Agave lechuguilla)*. The simplest cordage was made of withes of soapweed tied together but not twisted, the leaf being split into four strands with the thumbnail and the two butt ends tied together, making a cord five or six feet long. This was used in lashing the house frame together, thatching, suspending shelves, and tying up bundles of material.

Twisted cord was made of *a'ur* or lechuguilla. The Papagos describe this as having finer fibers than the agave which was eaten, though both might be used. The leaves were hacked off at the base of the plant with a chisel-pointed stick of hard wood, just as were those of sotol. The withered leaves which had dried out slowly were considered best; those which were cut green and baked had less strength in the fibers. The sharp needle ends were cut off the leaves and they were carried to a place where water was available for the shredding. The leaves were laid on a flat stone and pounded with another stone. The loosened pulp was combed out with a sharp stick and washed away with water.

For rope making, the fibers must again be moistened. They were then pulled into a fluffy bunch and rolled into cord on the spinner's bare thigh. Sitting on the ground, he fed the fibers and held them taut with his left hand, while his right rolled them downward, then let them spring back and twist.

For two-ply string two strands were rolled separately downward, then both together upward; this was the regular cord used in making the woman's carrying net and the men's net bag. Four-ply rope was made by doubling again

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283 and rolling in the opposite direction and this was used to attach the headband to the carrying net and later in making harness. Lechuguilla fibers and the prepared cordage were articles regularly used in bartering with the Pimas for blankets and cotton.

For fine string very little cotton was available, and human hair was easily obtained from older women who cut it at the shoulders for convenience. All hair was saved and the men made it into fine ropes, rolling it on the thigh like the lechuguilla fibers. Such ropes, always knotted at each end, were of necessity short but might be as thick as four-ply. Two-ply, four-strand hair rope was used to bind the carrying frame to its poles, and sometimes as lashing for a baby's cradle.

With the advent of horses the Papagos had a need both for long, strong ropes and material for making them, and they soon began to make ropes of horsehair, using for the purpose a primitive rope twister on the principle of an inverted spindle. This twister consisted of two pieces, the larger made of giant cactus rib *(Carnegia gigantea)*, the other of some hard wood such as creosote bush *(Covillea glutinosa)*. A four-strand rope made with the rope twister is the usual one used for halters and bridles.

Neither lechuguilla cord nor hair rope was very flexible so the Papagos had to resort at times to the highly valued buckskin thong, while for firm smooth fastenings there was no substitute for deer sinew, which shrinks tightly when it dries and obviates the necessity for knots.

Men who needed buckskin thongs usually obtained one or more deer skins by barter or by gift from the hunters. Thongs were used in wrapped twining, where the article must be flexible, like a door; also in cradle lashings, and especially for sandal fastenings. They were cut from a dressed piece of buckskin with a sharp flake of quartz.

Sinew was obtained principally from the back of a deer but also from the leg. It was rolled and stored and when wanted was soaked, a very fine strand loosened with

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the teeth, and pulled off. Sinew was always used for fasten- 283
ing the hafting of stone implements and attaching the feathers, foreshafts, and heads of arrows. For the bow string a two-ply cord of sinew was rolled on the thigh as fiber was rolled.

MEDICINAL PLANTS

755 Papago medicine men cured by singing, sucking, blow-
757 ing tobacco smoke, and waving eagle feathers over the patient. However, for ordinary ailments, there were common cures which every family knew, although complicated mixtures were often used by a housewife familiar with her pharmacopeia. This practical knowledge was often in the hands of women who gathered the herbs in season, dried and pounded them in a special mortar.

757 The most universal remedy was the creosote bush
278 *(Covillea glutinosa)*. It was used for stiff limbs, sores, and poisonous bites. Men, after running all day barefoot, would make a fire, and when it had burned out heap creosote branches on the ashes and hold their aching feet in the smoke. Women after childbirth or with menstrual cramps would lie on a bed of such heated branches. For rheumatism, the hot branches were wrapped in a cloth and laid on the joints. In case of a snake, spider, or scorpion bite, creosote leaves were chewed and placed on the swelling. The leaves were also boiled and given to the patient as an emetic.

For sore throat, the root of cañaigre *(Rumex hymenosepalus)* was pounded and swallowed dry, or a piece of the root might be held in the mouth. The effect was to coat the mucous membrane and make it less sensitive.

The remedy for toothache may have been merely a counter irritant. It was to bite and hold between the teeth either the wild bean *(Phaseolus acutifolius)* or the callous which grows on the branches of mesquite.

COLDS

Mesquite mistletoe, *kui haap*, leaves boiled and drunk.

SORE THROAT

Cañaigre, *siwitcuris (Rumex hymenosepalus)*, root powdered and eaten.

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STOMACH AND MENSTRUAL CRAMPS

Creosote mistletoe, *cīkoi haap (Phoradendron* sp.), leaves boiled and liquid drunk for stomach and menstrual cramps; for menstrual cramps woman also lies on heated branches.

Dandelion *(Taraxacum officinale)*, blossoms steeped in hot water to make tea for women with menstrual cramps.

RHEUMATISM

Creosote bush, *cīkoi (Covillea glutinosa)*, lay heated branches on joints.

SORE FEET

Creosote bush, *cīkoi (Covillea glutinosa)*, hold feet in smoke made by smoldering green branches.

CHILDBIRTH

Creosote bush, *cīkoi (Covillea glutinosa)*, woman lies on heated branches; dried pulverized leaves steeped in hot water and liquid rubbed on breasts to start milk flow; dried powdered leaf rubbed on infant's navel.

SORES

Bucknut, *hohohwi (Simmondsia californica)*, nuts parched, pulverized, and applied dry.

Cañaigre, *siwĭtcuris (Rumex hymenosepalus)*, roots ground and applied dry; has a drying effect.

Night-blooming cereus, *ho'o'k iwa (Cereus greggii)*, seed pod mixed with deer grease to make salve.

Mesquite gum *(Prosopis velutina)*, pulverized; when applied to sores becomes sticky and caked. Used for impetigo.

TOOTHACHE

Wild bean, *pahwi (Phaseolus acutifolius)*, held between teeth.

STINGS AND BITES

Creosote bush, *cīkoi (Covillea glutinosa)*, chewed and placed on bite made by snake, spider, or scorpion.

Mesquite, *kuĭ (Prosopis velutina)*, leaves chewed and placed on sting made by red ant.

EMETIC

Creosote bush, *cīkoi (Covillea glutinosa)*, leaves boiled and decoction drunk.

Lizard's tail, *yerba mansa, wawic (Anemopsis californica)*, leaves boiled and decoction drunk.

MISCELLANEOUS STRUCTURES, ACCESSORIES, AND PROCESSES

Houses

342 A dwelling on the flat land where the longest permanent residence occurred consisted of several structures: a dome-shaped brush house, one or more shades or *ramadas* for outdoor living, a small hut fifty or more feet away for menstrual segregation, and a low brush storehouse. The ceremonial house of each village was built like the residences, but larger.

The brush house is the same as that in which the Spaniards found the Papagos in 1697 (18). It has lasted until recent years, when the rectangular adobe house was borrowed from Mexico.

The brush house is built in a circular excavation about two feet deep. The core of the house consists of four or, for a large house, nine mesquite *(Prosopis velutina)* or ironwood *(Olneya tesota)* posts, forked at the top. Through the forks of the uprights, lighter poles of the same wood are laid. A close roofing of light, slender giant cactus *(Carnegia gigantea)* is now laid transversely across the horizontals, with a strong mesquite pole at each end. Slender mesquite poles are planted in a circle around the central core, about four feet away from it. Their tips are then bent over and tied to the horizontals and strong transverse poles with strips of soapweed fiber *(Yucca glauca)*. This forms the skeleton of the shallow dome which has been called the "wash basin" shape. The ribs of the dome are bound together with horizontal withes of ocotillo *(Fouquieria splendens)*, the frame having three rows of withes about two feet apart.

The house is thatched with any herbage available, but the preferred material is *siwĭpĭki wacai*, a red grass which grows about three feet tall. Upright bundles of this grass, about four inches thick, are piled against the frame, resting on the ground with their tops coming just above the lowest binding withe. They are then tied to the frame in a double row, a bundle inside opposite one outside. The tying

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is done with a large needle of sahuaro rib threaded with 342
fiber.

The roof was not finished until after the thatch was put on. Often, across the row of sahuaro ribs, another row was laid in the opposite direction for strength. If not, the builders proceeded to the next step which was to pile up a thick mass of creosote bush *(Covillea glutinosa)* on top of the sahuaro ribs. Earth was heaped over the creosote bush.

The doorway, which was the only opening, was closed with a plank-shaped structure made of several bundles of straw, held between pairs of sahuaro ribs tied transversely at top and bottom. To keep out animals during the day the family used a light door of sahuaro ribs tied together with buckskin thongs.

The shade was made exactly like the core of the house, 343
including the roof, and was generally placed away from the house so as to get the breeze on all four sides.

A family might own various storage huts. The more elaborate ones were built like the main dwelling except that they had no central core. Mesquite poles *(Prosopis velutina)* were set in a circle about eight feet in diameter and their tops bent over, not to meet but to form an opening about three feet wide. The poles were bound with ocotillo withes, thatched, and given a door like the main house. The sahuaro ribs for the roof were laid directly across the three-foot aperture at the top. They were then piled with brush and earth.

The menstruation hut, always some distance from the house, was a very low, circular structure with room for one woman to lie or sit in. The more elaborate ones were made in dome shape by planting mesquite poles in a circle, bending them over and tying the tops together with aloe fiber. Painstaking women might thatch the huts with straw, others would throw a mat on them or pile up a few bushes. Near temporary camps the women might merely tie the tops of a few creosote bushes *(Covillea glutinosa)* together. At present many women have well made adobe huts.

MUSICAL INSTRUMENTS

534 Papago musical instruments were the drum, the scraping stick, the gourd rattle, and the flute; cocoon and deer hoof rattles were used occasionally. The basket drum was the ordinary food bowl inverted and could be struck with the palm of the hand or with a stick, or used as a resonator under the scraping stick. Scraping sticks differed in the depth and frequency of the notches according to the songs for which they were used. Scraping stick songs were designed to avert evil and to bring rain, and these required a stick of ironwood *(Olneya tesota)* slightly concave and with far-spaced, deep notches which produced a loud rattle. A series of minor songs concerned an imaginary being, *pihuri*, who caused and cured sore eyes. These required a straight stick of sahuaro rib *(Carnegia gigantea)* with shallow, close-spaced notches, giving a much softer sound.

The rattle was a dried bottle-gourd fruit *(Lagenaria vulgaris)*, which desert Papagos do not now raise but get from the Altar valley. The fruits were dried, freed of their seeds and pulp, and these replaced by gravel. A handle was then made of peeled creosote bush wood *(Covillea glutinosa)* thrust through the gourd until its end just protruded, and fastened at both perforations with mesquite "gum" *(Prosopis velutina)*.

The flute is used only by individuals and never in ceremonies as is the basket drum. The only one seen was a vertical flageolet of a reed (probably *Phragmites communis)*, cut so that a joint came in the exact middle of its length; over this joint was a hole half an inch long which was closed when playing by tying a cloth over it. In the distal end were three holes which the fingers played upon.

534 White cocoons are picked from desert bushes, filled
301 with fine gravel, and strung on buckskin thongs, and these are worn around the ankle, knee, and waist in certain ceremonies. Deer hoof rattles are no longer worn.

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DRESSED SKINS

After removal from the animal, deerskins *(Odocoileus hemionus* and *O. couesi)* were dressed immediately; or, if this were not feasible, they were staked down in the sun to dry, then buried in a moistened hole dug in the earth until time to be dressed. 28/

For dressing, the skin was first soaked in water over night and wrung to remove as much of the water as possible. It was then hung over the scraping pole for fleshing and dehairing. The scraper used for this purpose was a slightly curved rod of catclaw *(Acacia greggii)* about a foot long, set at each end in a short handle of split cactus rib *(Carnegia gigantea)*. At the time the deer was skinned its brain was removed and mixed with dry grass, then shaped like a pancake. This was baked in hot ashes just long enough to prevent it from decaying and to bring out the grease. To make the hide more pliable for the pulling and stretching process this cake was either rubbed on the dry hide or mixed with water and the hide washed in this liquid. After pulling and stretching the hide for a whole day, as a final step it was staked out with creosote bush stakes *(Covillea glutinosa)* on the clean sand of a wash and beaten with the flexible stems of catclaw, peeled of bark and thorns.

The skins of both species of deer mentioned, of antelope *(Antilocapra americana)* and mountain sheep *(Ovis mexicanus)* were all treated in this way. Wildcat *(Lynx ruffus)*, mountain lion *(Felis oregonensis hippolestes)* and coyote *(Canis lestes)* were scraped without dehairing or softening, and used for quivers.

All buckskin for clothes or pouches was colored a terra cotta red with dye from the roots of *Krameria glandulosa*, [386] which were peeled, cut into inch lengths, finely split and then boiled. It was poured over the hide rather than allowing it to soak since this would cause stiffening, and one quart of the decoction would dye two deerskins. After the dyeing the hide was wrung dry and softened again but without grease.

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Thongs and loin cloths were cut from buckskin even before there were sewed garments. To mark a straight line for the cutting the worker blackened his bowstring with soot, laid it against the skin, then the cutting was done with a flake of flint. Sewing was first done on pouches and quivers, then on simple garments. The needle was an awl of very hard wood which had to be obtained from the Altar valley and was sharpened with a stone and its head hardened on the fire. The thread was a buckskin thong pulled out very thin, twisted tightly and wet in the mouth.

WEAPONS

At present bows are made of mulberry *(Morus microphylla)* or, in its absence, of box thorn *(Lycium fremontii)*. A long new mulberry shoot about two inches thick and five feet long was cut in the rainy season; then the bark was removed and the protuberances rubbed down with a stone. The last quarter of the length at both ends was tapered to an inch in diameter by scraping with a stone, the ends being finished with a notch for the string and a bulbous projection beyond it.

The bow was bent by laying it in hot ashes, stones being placed on and around it so as to bend the ends up at a gradual angle. The central part must not be bent at all since this would weaken it. The ends were next tied in position with strong cord of agave fibers (not the bowstring) and the bow set aside to dry thoroughly. It might then be painted with a series of red diagonal crosses down the outside, or it might have wrappings of deer sinew at either side of the hand grip.

The bowstring was a two-ply cord of deer sinew which was soaked, split with the teeth and rolled on the thigh. This hard rough cord was made rather smooth by running it through a small perforation bored in a stick of sahuaro wood *(Carnegia gigantea)*.

The Papagos usually made stone-tipped arrows for war and large game, but wooden-tipped ones for small

17:Castetter & Underhill N,E-5 (1931-1934) 1935
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game. The stone tip was set in a foreshaft of hardwood, usually creosote bush *(Covillea glutinosa)*, although wood of the desert broom *(Baccharis sarothroides)*, or the soapberry or Chinaberry tree *(Sapindus drummondii)*, might also be used. The twigs were cut green, peeled and straightened by hand or with a stone arrow straightener, then laid away to dry. On the day of the arrow making they were split at one end to receive the tip and dipped in boiling "gum," which must always be the secretion found on the white brittlebush *(Encelia farinosa)*, since mesquite "gum" melts in the sun and creosote bush "gum" is too sticky and adheres when the arrow goes through the grass. The arrow point was inserted in the slit at the end of the twig and when the "gum" had cooled, tied with a wet sinew. For shaft material a piece of the flower stalk of the Spanish Bayonet *(Yucca elata)*, which is very light when dried, was used. However they also used for this purpose a reed (probably *Phragmites communis)*, which they picked along the streams of the Pima country when they went there to work or trade. A hole two inches deep for the insertion of the foreshaft was bored in the pithy center of the shaft with a stick of creosote bush *(Covillea glutinosa)* sharpened to a point and roughened for friction with a stone. The end of the foreshaft was pointed with a quartz scraper, the foreshaft pounded into the hole and deer sinew wrapped around the joint for the whole of its length.

The preferred feathers for war arrows were those of the eagle *(Aquila chrysaetos)* and of three genera of hawks. The buzzard *(Cathartes aura septentrionalis)*, turkey *(Meleagris gallopavo merriami)* and crow *(Corvus brachyrhynchos hesperis)* were ineligible "as the buzzard is stupid and does not kill and the other two birds are timid." Chicken hawks *(Accipiter* sp.) were kept in cages and their tail feathers plucked.

The quill was reduced by cutting off the tip to about five inches in length, after which it was split and the inside cleaned with the thumbnail. It was then scraped bare for

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237 half an inch at each end and laid in a slightly spiral direc-
411 tion on the shaft just behind the nock, and both bare ends of the quill were bound on with wet sinew. Either two or three feathers were used for war arrows.

411 Wooden-tipped arrows were made of wood of the creosote bush *(Covillea glutinosa)* or of the arrow bush *(Pluchea sericea)* and might be full length with the tip rubbed sharp on a stone and hardened in the fire; or they might have a shaft of reed or Spanish Bayonet *(Yucca elata)* for three quarters of their length. This made an exceedingly light arrow particularly desirable for birds.

411 Quivers are of comparatively recent invention. Some
415 were made from the skins of such animals as the mountain lion *(Felis oregonensis hippolestes)*, wildcat *(Lynx ruffus)* or coyote *(Canis lestes)* with the hair left on, the skin not being softened but sewed up while fresh and allowed to dry hard. The legs and tail were cut off (excepting the coyote whose tail was left for decoration) and the skin sewed up in rough bag shape. The head, from which the skull was removed, was left on and stuffed with grass so it would dry into the proper shape. The hollow head served as a hood over the arrows.

All these skins made small quivers and were used in hunting. For war, large quivers were made of antelope hide *(Antilocapra americana)*, and such hide was cut and sewed in the shape of a cylinder a foot in diameter. In some cases a fringe of dressed buckskin appeared down the vertical seam.

Particular individuals had their quivers made of dressed and softened hide, generally from the white-tailed
[533] deer *(Odocoileus couesi)* or antelope. These might have a fringe down the seam and a painted design of some brave animal on the back, the design being outlined with the secretion from the white brittlebush *(Encelia farinosa)*, then
[384] smeared over with red clay. Sometimes a yellow paint made from Spanish Bayonet flowers *(Yucca elata)*, ground to powder, was used. The quiver was slung by a strap two

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inches wide made of fox skin *(Vulpes fulvus)* with the hair left on to prevent chafing. 411 415

The Papagos at present say that certain of the bravest men fought with club and shield, and a club is mentioned for the "Pimas" in early Spanish accounts (10, 27). The club was of ironwood *(Olneya tesota)* about eighteen inches long, and informants say that it was merely a roughly shaped length of wood with a thong run through a perforation in the upper end so that it could be carried. The shield was a disk of leather sixteen inches in diameter made of cowhide or horsehide. Ownerless cows and horses have roamed the country ever since the coming of the first Spaniards, and the Papagos hunted these like deer.

The customary way of making the shield was to soak the hide in water, then cut out the disk and lay it on hot ashes to harden, stamping it into a slightly convex shape, two holes first being punched near the center about six inches apart. When dry a thong was laid along the outside of the shield, its two ends passing to the inside through these holes. On the inside was a short stick of wood with notched ends to which the thong ends were tied, forming a handle. When dry the shield was painted with mesquite "gum" *(Prosopis velutina)* prepared as for pots, or with red and white clay. 531

FIRE

Fire was made with the palm drill; the heart of a cactus rib *(Carnegia gigantea)* was held with the feet while the drill of creosote bush wood *(Covillea glutinosa)* or arrow bush *(Pluchea sericea)* was revolved between the palms. A little sawdust from dry sahuaro rib caught the spark which was transfererd to a pile of dry grass and manure. 372

POTTERY, EATING AND DRINKING VESSELS

Although a few old pottery jars appear to have lines in red ochre at present all decorations are in black. This black is usually made from the secretion of the mesquite 323 415 386

17:Carretter & Underhill N.E-5 (1931-1934) 1935
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323 415 386 bush *(Prosopis velutina)*, which is scraped off in summer after the rains, made into balls and stored. When needed for use these balls are boiled in water, strained through a cloth, boiled again until syrupy, and applied with the tip [177] of a feather. The informants stated that the use of this substance was learned from the Maricopas.

323 In the making of pottery two paddles are used, usually of mesquite wood *(Prosopis velutina)*, one for the bottom and one for the sides of the jar. The one for the bottom is shaped like our butter paddles while the one used for the sides is shaped like a cleaver. Among the Papagos pottery is not coiled as is the case among the Pueblo Indians, but is always paddled into shape.

415 Drinking cups are usually made of gourds *(Lagenaria vulgaris)*, although small baskets might also be used. Gourd drinking cups are made of the gourd fruit cut in two longitudinally while fresh, the pulp and seeds removed and the hollow hemispherical halves then dried. A hole is punched in the shells and they are then strung on a man's belt with a buckskin thong. Often they are the only eating and drinking vessels on journeys.

Another vessel is furnished by the giant cactus *(Carnegia gigantea)*. When the surface of this plant is bruised such as by the pecking of woodpeckers the plant responds by covering the wound with a hard scar. This scarred area is sometimes rather large and deep, forming a natural cup-shaped structure which is used by the Papagos as a dish or a tobacco pouch. These dishes are eagerly collected and most households have an assortment of them.

Russell (22) refers to the Pima as obtaining small wooden trays and plates—circular, elliptical, and rectangular—from the Papagos. He also refers to the Papagos as making ladles of palo verde wood *(Parkinsonia microphylla)*. These are probably Mexican in origin.

17:Castetter & Underhill N.E-5 (1931-1934) 1935
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CEREMONIAL OBJECTS AND PRACTICES

The Papagos make a number of rather crude ceremonial objects which ritual demands must be thrown away after each ceremony. Masks are made of half a gourd *(Lagenaria vulgaris)* tied with buckskin thongs and covering only the eyes and nose of the wearer. The face is crudely painted on it with clay, and small perforations made for seeing and breathing. A more valuable mask, kept from year to year, is that belonging to the hereditary clown. It is made of white buckskin, bag shaped, the closed end of which comes at the top of the wearer's head and the open fringed end to his shoulders. A small face is painted on it with blue soot from creosote bush wood *(Covillea glutinosa)*.

The body is often ceremonially marked with clay colored yellow with a decoction of dandelion flowers *(Taraxacum officinale)*.

Fetishes were made on various occasions: for the *vikita* or harvest festival, for the *tc'ïrkona*, or visiting dance, when a visiting village entertained its hosts before racing with them; and for a ceremony to insure the growth of wild crops. These effigies were usually made to illustrate the content of a dream. For the *vikita* there were hereditary dream singers who every four years produced a new series of songs and ordered the making of some object to illustrate them. There was a standard range of subjects, including clouds, deer, corn, squash, mountains, and sea birds, though an inventive author sometimes provided a new subject like a mythical monster.

Very little material was available for these structures but they showed considerable extempore invention. A framework was made of ocotillo rods *(Fouquieria splendens)* tied together with thongs, and on this could be draped white buckskins to represent clouds, or reddish dyed ones for mountains. The facsimiles were mounted on a wicker frame of sahuaro ribs *(Carnegia gigantea)*. Large white birds were made on a skeleton of ocotillo ribs covered with raw cotton. Squash effigies were contrived from ocotillo

349 and dyed buckskin, corn of ocotillo rods painted with dots,
532 and with soapweed leaves *(Yucca glauca)* attached to represent corn leaves. The same range of subjects was used to illustrate the visiting dance.

The effigies used for the wild crops represented sahuaro and prickly pear fruit *(Opuntia* sp.) and might be of red clay or of red ocotillo blossoms. An effigy mesquite bean was made of a twig (19).

293 Prayer sticks were made of catclaw *(Acacia greggii)*
778 upon which was tied eagle down *(Aquila chrysaetos)*, except for a special harvest ceremony at Quitovac in Sonora where it was "given" the people by Elder Brother to use turkey feathers *(Meleagris gallopavo merriami)*. Some prayer
[386] sticks were colored blue with soot from a fire of creosote bush *(Covillea glutinosa)*, the colored stick representing growing corn, the turkey feather the leaves (19).

Dancers at the harvest ceremony carried wands five feet long with bunches of eagle tail feathers at each end and in the middle. Individuals who had had curing dreams
[532] sometimes made fetishes to represent the animals which had taught them. Thus the horned toad *(Phrynosoma coronatum)* was often carved out of wood.

532 An enemy slayer had made for him an effigy of an Apache, using the hairs he had taken from the slain man's temples. The slayer's guardian if skillful contrived a doll of buckskin dressed in Apache costume and wearing the hair.

783 Tobacco smoke *(Nicotiana trigonophylla* and *N. taba-*
276 *cum)* was regarded by the Papagos as a purifying agent. The medicine man, while singing over a patient to "see" the cause of disease, paused regularly to smoke and blew the smoke over the patient as a means of cleansing.

The man who had come into contact with the supernatural by killing an enemy or an eagle, or by joining the salt pilgrimage, had to be purified by a period of segregation and fasting. When this period was ended, older men who had been through the same experience, sang a series of

17:Castetter & Underhill N.E-5 (1931-1934) 1935
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ritual songs. Then each separately approached the neophyte 783
and blew tobacco smoke over him, auguring success for his 276
future. In the case of a man who had killed an enemy, those who blew the smoke held in their mouths one of two roots, yerba mansa *(Anemopsis californica)* or an unidentified sweet-scented grass, according to the section of the tribe to which the neophyte belonged.

Corn meal was sprinkled on the sea during the cere- 788
monial expedition to secure salt. It was also sprinkled on the ground in front of the singers at the harvest dance. Finally, it was taken in the hand as an offering when a ceremonial favor was requested.

GAMES

The Papagos played the usual games common to the 526
Indians of the Southwest (8). Kickball was played by men with a sphere of mesquite wood *(Prosopis velutina)* about the size of a modern croquet ball. Or the ball might be a pebble embedded in a sphere of mesquite gum. Women played double ball, a form of shinny, with a "ball" made of two hanks of agave fiber cord tied together with two inches of string. Or they might use two deer knuckle bones in the same way. The stick was a peeled wand of ocotillo, slightly curved at one end.

The game known as *kinyiskuḥ* was like our parchesi, 524
played outdoors on a square the size of a room, marked out by stones and with smooth round stones as the moving pieces. Each move was decided by a throw of four dice. These were sections of giant cactus rib *(Carnegia gigantea)* about eight inches long with patterns marked with red clay and blue soot of creosote bush *(Covillea glutinosa)*. Women played dice with sticks made from the split halves of ironwood sticks *(Olneya tesota)*. The convex side of each was blackened with soot and the straight side left white. Each woman threw four and the score depended on the number of white and black sides which fell upward.

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524 The game of hidden ball was played by hiding a wild bean *(Phaseolus acutifolius)* in one of four tubes of cane variously marked in red and blue. All the tubes were filled with sand and the guesser had to determine which of them held the bean. Or the bean might be hidden in one of four mounds of sand. The "chips" for keeping score were corn kernels. The Papagos also played the "hand game" in which the members of one side hold sticks of two or more colors in their closed fists and the members of the other guess their position. The sticks were two-inch lengths of creosote bush, natural white or blackened with soot.

The ring and pin game was played with a ten-inch length of creosote bush as the pin. To its butt end was attached an eighteen-inch buckskin thong, on which were strung eight discs of dried pumpkin rind about three inches in diameter with an inch-wide hole in the middle. The game was to throw up the rings and, as they came down, run the point of the stick through as many as possible.

526 541 Dried pumpkin had another use, half play and half ceremonial. When one village was challenging another to games, two heralds came ahead of the main party. It was the custom of the challenged village to run the heralds out of town after their announcement by pelting them with dried pumpkin peduncles. This may have been symbolic of a war challenge.

526 857 Papago children played cat's cradle with lengths of agave fiber and cotton string. They made dolls of leaves stuck together with twigs, or sometimes of deer bones dressed in scraps of buckskin.

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17:Castetter & Underhill N,E-5 (1931-1934) 1935
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17: Castetter and Underhill
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17: Castetter and Underhill
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[For a description of the use of animals by the Papago, see category 116, pp. 40-52, 61-63, and 68-73. --Analyst]